CHRYSLER

1957 SERVICE MANUAL

IMPERIAL

CHRYSLER SERVICE MANUAL

MODELS

C-75-1 (WINDSOR) C-75-2 (SARATOGA)

C-76 (NEW YORKER) IM-1-2-4 (IMPERIAL)

This Manual is compiled as a reference and guide to provide Chrysler service men with proper adjustment and repair procedures for servicing the 1957 Chrysler Cars.

An understanding of the material compiled herein, and in the supplementary service bulletins, will assist the service personnel to maintain the quality standards built in Chrysler Cars.

In order to use this Manual to best advantage the corresponding or superseding car models must be understood. The supersedence of these models is as follows:

	1955	1956	1957
Windsor	C-67	C-71	C-75-1
Saratoga	—	—	C-75-2
New Yorker	C-68	C-72	C-76
Imperial	C-69	C-73	IM-1-2-4
Crown Imperial	C-70	C-70	—

The service tools referred to in this Manual are available through the Miller Manufacturing Company, 5919 Tireman Avenue, Detroit, Michigan, U.S.A., unless otherwise specified.

Extra copies of this Manual are available at $4.00 each, under Part Number D-15899. Order from Chrysler Division, P. O. Box 1658, Detroit 31, Michigan.

CHRYSLER DIVISION

Chrysler Corporation

DETROIT 31, MICHIGAN

Chrysler Corporation reserves the right to make changes in design or to make additions to or improvements in its product without imposing any obligation upon itself to install them on its products previously manufactured.

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FACTORY CONTACT

The following outline of the proper procedure to use in contacting the factory for assistance or advice on any matter applying to Service will insure your inquiries receiving prompt attention and handling. Make certain those members of your organization who might have the occasion to contact the factory, are thoroughly familiar with this procedure.

Do not withhold action on any matter pending contact by a Factory Service Representative as his scheduled contact may be delayed by special assignments. When in doubt as to the proper procedure to follow in the handling of a claim or complaint, prompt results can be obtained through a letter, telegram or phone call to the proper Factory Service Department—making certain to include the necessary information. If the aid of a Service Representative is necessary, the Factory Division involved will arrange for his contact as promptly as circumstances permit.

CHRYSLER DIVISION

All correspondence, telegrams, or phone calls, pertaining to Chrysler Cars, EXCEPT THOSE COVERING PARTS ORDERS, as well as orders or requests for Chrysler Service Bulletins, Owners Manuals, Shop Manuals, Time Schedule Manuals or other Chrysler Service literature, should be addressed to:

(Letters)
Chrysler Corporation
Chrysler Division
Service Department
P. O. Box #1658
Detroit 31, Michigan

(Telegrams)
Chrysler Division
Attention,
(Name of person to whom sent)
WUX
Detroit 31, Michigan

(Phone) VAlley 2-4700

NOTE: Please make certain to include the code WUX on all telegrams to either the Chrysler Division or Plymouth Division as this insures delivery direct to our Teleprinter Room thus eliminating delay.

Letters or telegrams should be confined to one subject only and should include the following information:

Car Serial Number
Date of Sale
Owner's Name
Mileage

Complete description of difficulty, corrective action taken, your recommendations as to what should be done and the reason for so doing.

Include Paint and Trim Code Numbers where finish, upholstery, body or sheet metal is involved, and estimate of net cost of repairs.

PLYMOUTH DIVISION

All correspondence, telegrams, or phone calls, pertaining in any way to Plymouth cars, as well as orders or requests for Plymouth Service Bulletins, Owner Manuals, Time Schedule Manuals or other Plymouth Service literature, should be addressed to:

(Letters)
Chrysler Corporation
Plymouth Division
Service Department
P. O. Box #1518
Detroit 31, Michigan

(Telegrams)
Plymouth Division
Attention,
(Name of person to whom sent)
WUX
Detroit 31, Michigan

(Phone) WAlnut 1-8240

MASTER TECHNICIANS SERVICE CONFERENCE

All correspondence concerning enrollment in the M.T.S.C. Program, changes in enrollment records (the adding or dropping of personnel), issuance of awards, status of enrolled personnel, orders for additional material, the return of questionaires, or any other matters relating to this program should be addressed to:

Master Technicians Service Conference
Chrysler Corporation
Plymouth Division
P. O. Box #1518
Detroit 31, Michigan

PARTS DIVISION

General

ALL orders for parts or accessories, emergency or otherwise, should be forwarded direct to your usual source of supply or to the parts plant listed below serving the area in which you are located.

To insure your receiving the parts required by you more promptly, close attention should be given to the procedure listed under "Ordering Information" and "Your Parts Orders" in the introductory front pages of all MoPar Parts Lists. Particularly where parts are ordered for a specific car, it is very essential that your order include the car serial and engine numbers, and, in the case of body parts, the body number.

ATLANTA

Chrysler Corp., Parts Division
Station A, P.O. Box 206
Atlanta, Georgia
Phone—Plaza 5-2531

DELAWARE

Chrysler Corp., Parts Division
South College Avenue
Newark, Delaware
Phone—Newark 2521

KANSAS CITY

Chrysler Corp., Parts Division
Chrysler and Funston Roads
Kansas City 15, Kansas
Phone—Fairfax 3300

PACIFIC COAST

Chrysler Corp., Parts Division
1950 Davis Street
San Leandro, California
Phone—Sweetwood 8-6200

Centerline

Chrysler Corp., Parts Division
P.O. Box 779
Detroit 31, Michigan
Phone—Jefferson 9-3000

Parts Division Literature

Requests for Parts Division literature such as Parts Books, Parts Price Lists, Parts Bulletins, etc., should be forwarded direct to:

Chrysler Corporation, Parts Division
P. O. Box 1718
Detroit 31, Michigan
Attention: Parts Advertising Department

Shortage of Accessories or Other Equipment on New Cars

Before placing an order for missing accessories, other parts or equipment, on new cars received, examine the vehicle for the presence of a "back order" notice, which if present, will be found attached to the bracket for the inside rear view mirror. Such back-ordered short items will be shipped from the assembly plant as soon as stock is available, and should not be ordered from the Parts Division.

Emergency Orders

Where a part required for an "Emergency" is not readily available from your usual parts source, an order plainly marked "Emergency Order" and including complete details on the need for the material, should be placed with the above parts plant serving the area in which you are located. Orders so marked and which are, in the opinion of the Parts Division, for a bona fide immediate emergency need, will receive emergency handling. Emergency orders *should not* be forwarded to the Division Service Department.

Should the occasion arise that the part required is not available at the plant ordered from, you will be notified that the part is on back-order. In the meantime, your order will continue to receive emergency handling by the Parts Division with shipment being made as promptly as it is available.

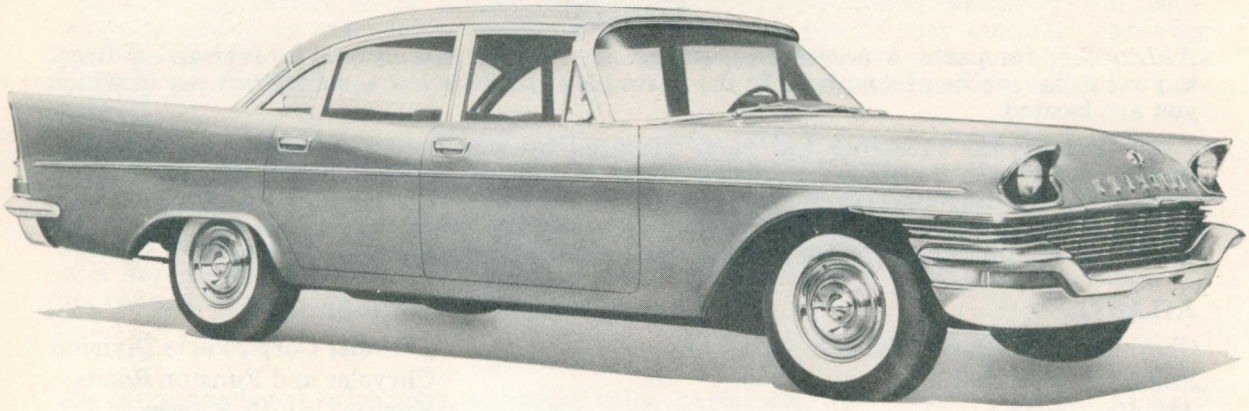

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Fig. 1 — Model C-75-1 Windsor

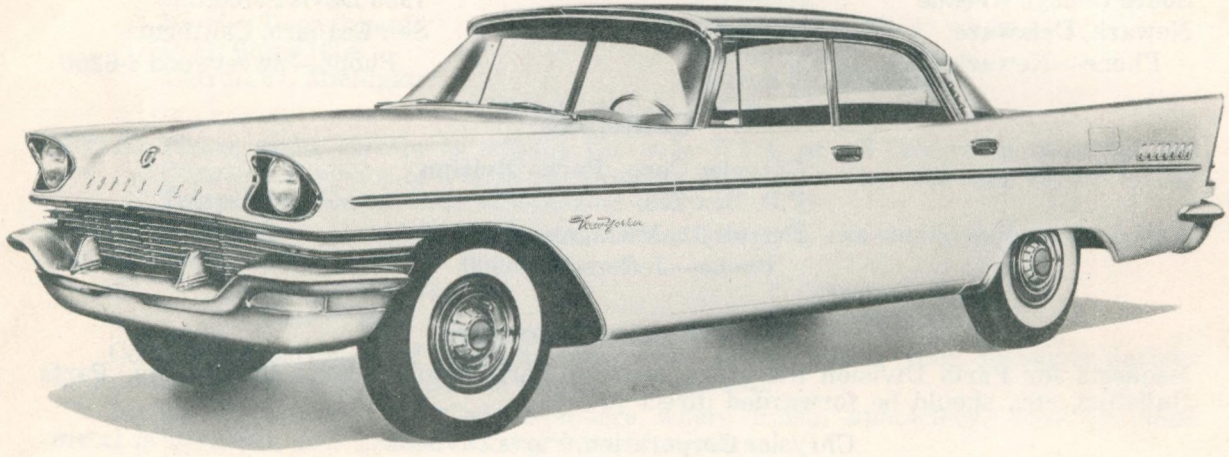

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Fig. 2 — Model C-76 New Yorker

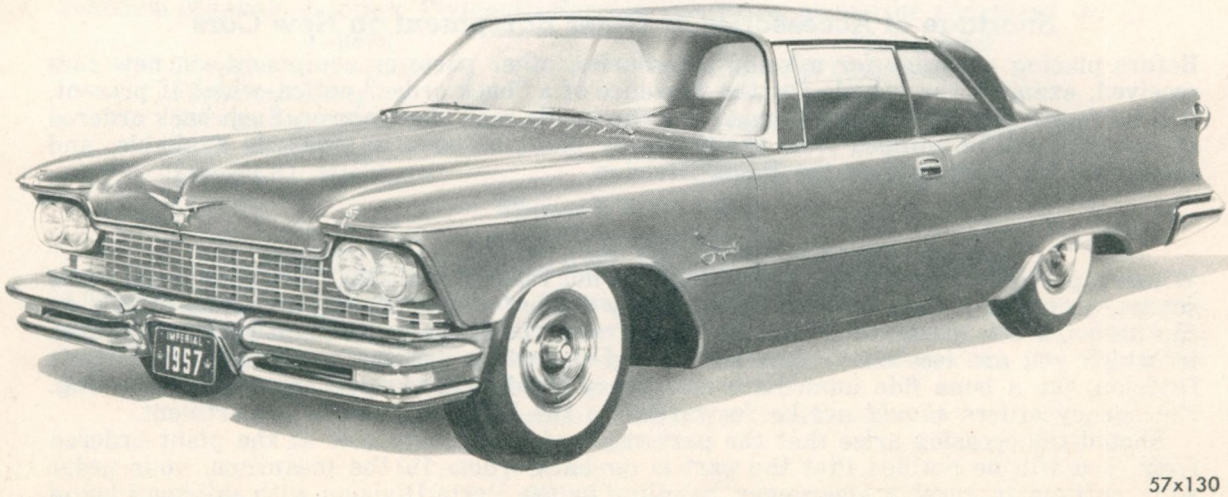

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Fig. 3 — Model Imperial

LICENSE DATA

The following revised method of numbering vehicles and their engines made in Detroit and Los Angeles production Plants will be used on the 1957 Models.

This revision will provide the Sales Department with the information desired as to model, year built and the serial number.

For Detroit built cars, the vehicle number will be revised as follows:

Windsor	W571001
Saratoga	L571001
New Yorker	N571001
Imperial	C571001

Model
Year Built
Serial Number

For L. A. built cars, the vehicle will be revised as follows:

Windsor	W57L1001
Saratoga	L57L1001
New Yorker	N57L1001

L. A. Identification

The Engine number will be revised as follows:

Windsor	WE571001
Saratoga	LE571001
New Yorker	NE571001
Imperial	CE571001

Model
Denotes Engine
Year Built
Serial Number

VEHICLE NUMBER

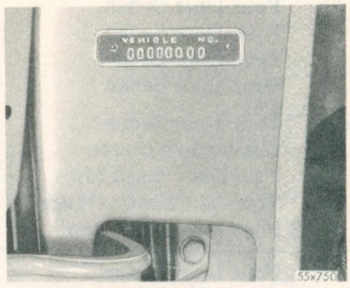

Fig. 4 — Vehicle Number

The vehicle number is stamped on a metal plate attached to the left front door body hinge post, as shown in Figure 4.

ENGINE NUMBER

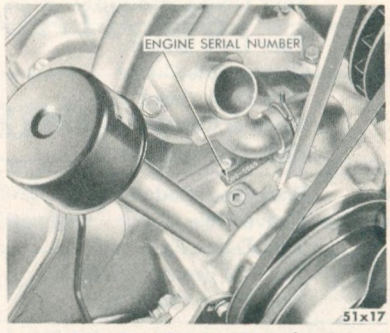

Fig. 5 — Engine Number

The engine number is stamped on a boss on the top side of the cylinder block just back of the water pump, as shown in Figure 5.

BODY NUMBER

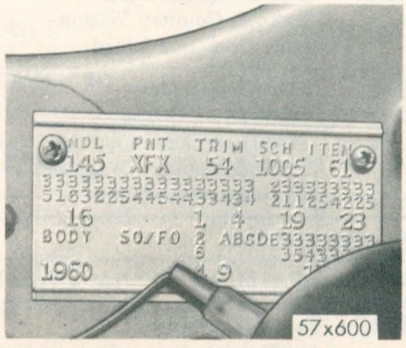

Fig. 6 — Body Number

The body number is stamped on a metal plate attached to the top side of the yoke, as shown in Figure 6.

GENERAL DATA AND SPECIFICATIONS

Item	Body Style	Starting Vehicle Numbers		1957 Models			
		Detroit	Los Angeles	C-75-1	C-75-2	C-76	IM-1, 2 & 4
	Four Door Sedan	W571001	W57L1001	Windsor	.....	.....	.....
	Four Door Sedan	L571001	L57L1001	.....	Saratoga	.....	.....
	Four Door Sedan	N571001	N57L1001	.....	.....	New Yorker	.....
	Four Door Sedan	C571001	.....	.....	.....	.....	Imperial
Wheelbase	Four Door Sedan	.....	.....	126	126	126	129
	Convertible Coupe	.....	.....	.....	.....	126	129
	Two Door (hard top)	.....	.....	126	126	126	129
	Town & Country Wagon	.....	.....	126	.....	126	.....
	Four Door (hard top)	.....	.....	126	126	126	129
Tread (Front)	Four Door Sedan	.....	.....	61.0	61.0	61.2	61.9
	Convertible Coupe	.....	.....	.....	.....	61.2	61.9
	Two Door (hard top)	.....	.....	61.0	61.0	61.2	61.9
	Town & Country Wagon	.....	.....	61.0	.....	61.2	.....
	Four Door (hard top)	.....	.....	61.0	61.0	61.2	61.9
Tread (Rear)	Four Door Sedan	.....	.....	59.7	59.7	60.0	62.4
	Convertible Coupe	.....	.....	.....	.....	60.0	62.4
	Two Door (hard top)	.....	.....	59.7	59.7	60.0	62.4
	Town & Country Wagon	.....	.....	59.7	.....	60.0	.....
	Four Door (hard top)	.....	.....	59.7	59.7	60.0	62.4
Length with Bumper	Four Door Sedan	.....	.....	219.2	219.2	219.2	224.2
	Convertible Coupe	.....	.....	.....	.....	219.2	224.2
	Two Door (hard top)	.....	.....	219.2	219.2	219.2	224.2
	Town & Country Wagon	.....	.....	218.9	.....	218.9	224.2
	Four Door (hard top)	.....	.....	219.2	219.2	219.2	224.2
Width with Bumper	Four Door Sedan	.....	.....	78.8	78.8	78.8	81.2
	Convertible Coupe	.....	.....	.....	.....	78.8	81.2
	Two Door (hard top)	.....	.....	78.8	78.8	78.8	81.2
	Town & Country Wagon	.....	.....	78.8	.....	78.8	.....
	Four Door (hard top)	.....	.....	78.8	78.8	78.8	81.2
Rear Axle with Manual Transmission	Four Door Sedan	.....	.....	3.73	.....	.....	.....
	Convertible Coupe	.....	.....	.....	.....	.....	.....
	Two Door (hard top)	.....	.....	3.73	.....	.....	.....
	Town & Country Wagon	.....	.....	3.73	.....	.....	.....
	Four Door (hard top)	.....	.....	3.73	.....	.....	.....
Rear Axle with Torque-Flite Trans.	Four Door Sedan	.....	.....	3.18	3.18	3.18*	3.18*
	Convertible Coupe	.....	.....	.....	.....	3.18*	3.18*
	Two Door (hard top)	.....	.....	3.18	3.18	3.18*	3.18*
	Town & Country Wagon	.....	.....	3.36	.....	3.36	.....
	Four Door (hard top)	.....	.....	3.18	3.18	3.18*	3.18*
Tire Size	Four Door Sedan	.....	.....	8.50x14	8.50x14	9.00x14	9.50x14
	Convertible Coupe	.....	.....	.....	.....	9.00x14	9.50x14
	Two Door (hard top)	.....	.....	8.50x14	8.50x14	9.00x14	9.50x14
	Town & Country Wagon	.....	.....	8.50x14	.....	9.00x14	.....
	Four Door (hard top)	.....	.....	8.50x14	8.50x14	9.00x14	9.50x14

*2.92 in Flat Areas of U.S.

**IM-1 No Convertible Model **IM-4 Four Door Sedan Only

Shipping Weight (Four Door Sedans)

C-75-1 4360 Pounds Including Standard 3-Speed Transmission **Only!**

C-75-2 4400 Pounds Including Power Steering and Automatic Transmission.

C-76 4550 Pounds Including Power Steering and Automatic Transmission.

IM-1 4925 Pounds Including Power Steering and Automatic Transmission.

Section I
TORSION-AIRE
FRONT WHEEL SUSPENSION

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DATA AND SPECIFICATIONS

MANUAL STEERING

Caster	Camber	Steering Axis Inclination	Toe-In
— ¾° ± ¾°	+ 0° ± ¼° (right) + ¼° ± ¼° (left)	5° to 7° At 0° Camber	⅛" ± 1/32" (⅛" Preferred)

WITH POWER STEERING

Caster	Camber	Steering Axis Inclination	Toe-In
+ ¾° ± ¾°	0° ± ¼° (right) + ¼° ± ¼° (left)	5° to 7° At 0° Camber	⅛" ± 1/32" (⅛" Preferred)

SPECIAL TOOLS

C-3553 ..... Remover and Installer—Shock Absorber Lower Bushing
C-3557 ..... Installer—Lower Control Arm Bushing
C-3558 ..... Remover and Installer—Upper Control Arm Bushing
C-3561 ..... Wrench—Ball Joint Assembly to Upper and Lower Control Arm
C-3564 ..... Remover—Ball Joint Stud

TIGHTENING SPECIFICATIONS

	Foot-Pounds
Shock Absorber Upper Mounting Nut	25
Shock Absorber Lower Mounting Nut	40
Sway Eliminator Shaft Link Nuts	15
Sway Eliminator Insulator Retainer Nuts	25
Upper and Lower Control Arm Ball Joints	250
Lower Ball Joint Stud Nut	135
Strut to Lower Control Arm Mounting Bolts	65
Lower Control Arm Strut Bushing Nut	35
Shaft to Lower Control Arm Bushing Retaining Nut (Inner)	125
Upper Ball Joint Stud Nut	135
Lower Control Arm Shaft to Crossmember Mounting Nut	200
Upper Control Arm to Support Bracket Mounting Bolt Nuts	55–65
Control Arm Support Bracket to Frame Bolt (½")	70
Steering Knuckle to Brake Support Bolt	55
Steering Knuckle to Steering Knuckle Arm Nut	50

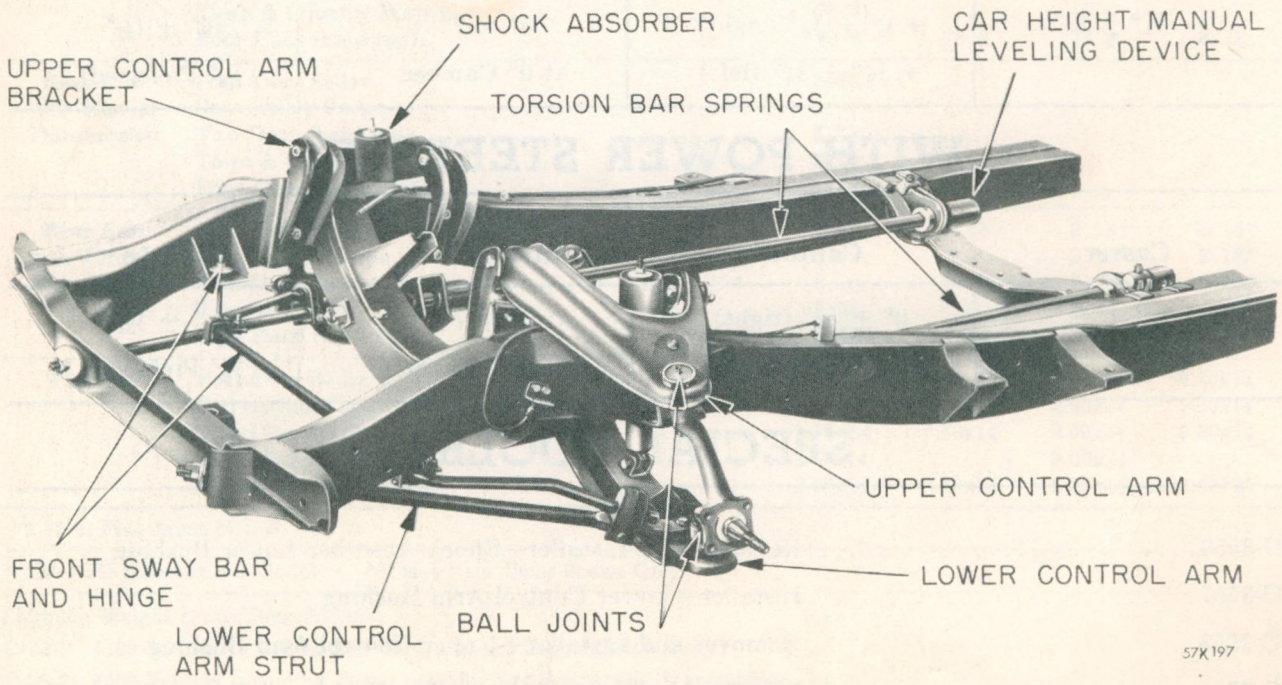

Fig. 1—Frame and Front Suspension

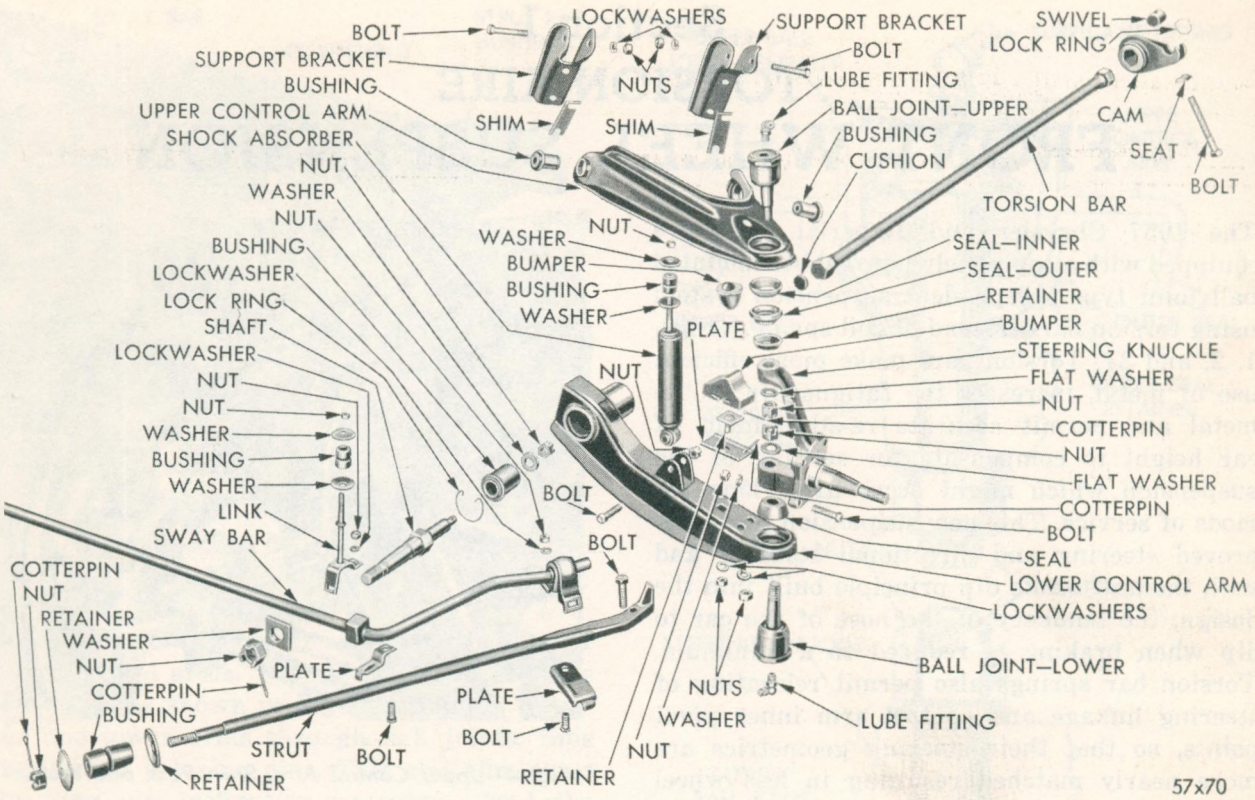

Fig. 2—Front Suspension (Disassembled View)

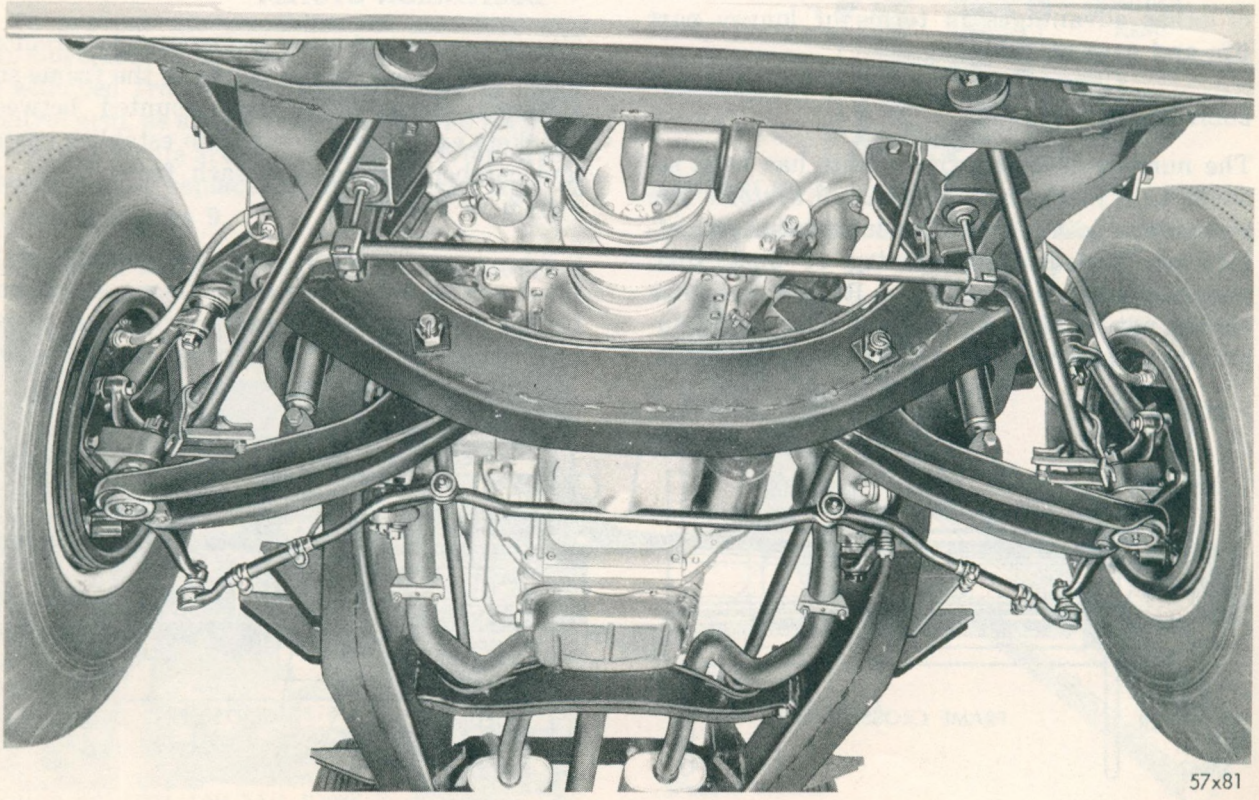

Fig. 3—Lower View Front Suspension Assembly

Section I
TORSION-AIRE
FRONT WHEEL SUSPENSION

The 1957 Chrysler and Imperial Cars are equipped with a completely new rubber mounted ball joint type independent suspension system using torsion bars instead of coil spring. (Figs. 1, 2, and 3). Torsion bars make more efficient use of metal, increases the fatigue life of the metal and permit accurate re-adjustment of car height to compensate for settling of the suspension which might occur after long periods of service. This new suspension gives improved steering and directional stability and with the anti-brake dip principle built into the design, the tendency of the nose of the car to dip when braking is reduced to a minimum. Torsion bar springs also permit relocating of steering linkage and control arm inner pivot points, so that their steering geometrics are more nearly matched resulting in less wheel fight because the vertical movements of the road wheels have little effect on the steering linkage. The new system also offers a number of other advantages in terms of longer part life and ease of servicing.

Lubrication

The number of lubrication points has been reduced to 8 in the new suspension system. The suspension points requiring lubrication are effectively sealed against entry of dust, dirt, water or other contaminants. Rubber bushings should not be oiled or greased. The use of lubricant causes pre-mature failure of bushings.

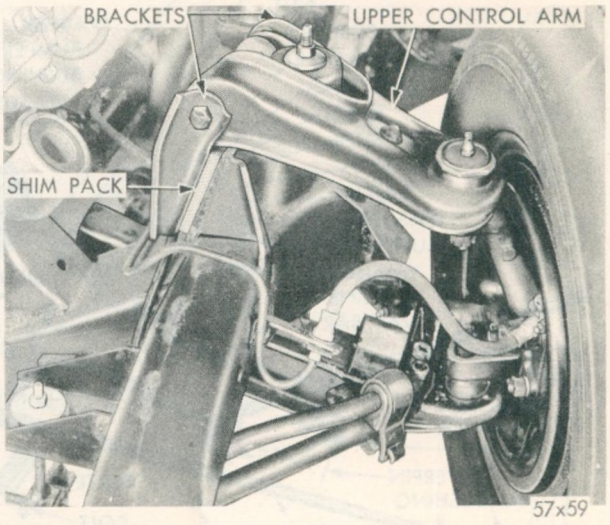

Fig. 4—Upper Control Arm, Shim Pack and Bracket

1. SERVICING THE FRONT SUSPENSION SYSTEM

The upper control arms are mounted on removable brackets which are bolted to the frame sub side-rail. Shim packs are mounted between brackets and frame side-rail to establish caster and camber settings for each front wheel, as shown in Figure 4.

The lower control arms are assembled to pivot shafts and mounted to frame crossmember in replaceable rubber bushings, as shown in Figures 5 and 6. The pivot shafts extend

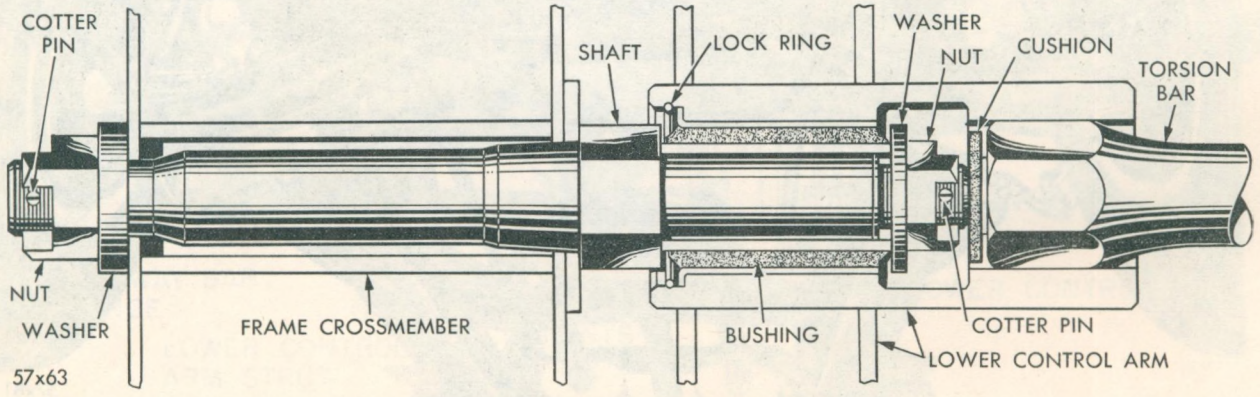

Fig. 5—Lower Control Arm Pivot Shaft and Bushing Assembly

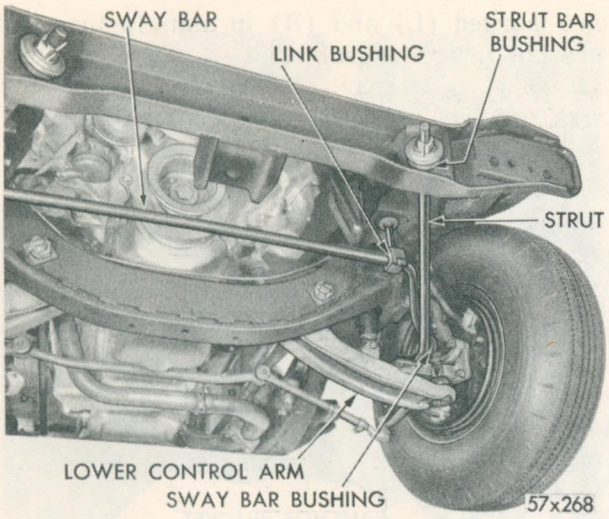

Fig. 6—Lower Control Arm, Strut and Sway Bar Assembly

through the crossmember and from the axis of lower control arms. The steering knuckles are connected, as shown in Figures 7 and 8, to upper and lower arms through ball joints, thus eliminating the king pins. This also eliminates the king pin inclination procedures and the term "Steering Axis Inclination" will be used hereafter.

To prevent the possibility of any fore and aft movement of the lower control arms, a strut is attached from frame crossmember to lower control arm, as shown in Figure 6. The forward end of the struts are mounted in the front crossmember with replaceable rubber bushings, as shown in Figure 9.

The sway bar shaft is insulated and mounted

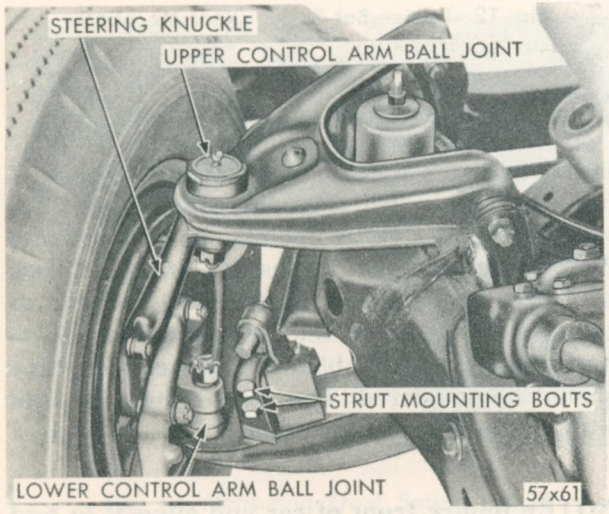

Fig. 7—Steering Knuckle and Ball Joint Assembly

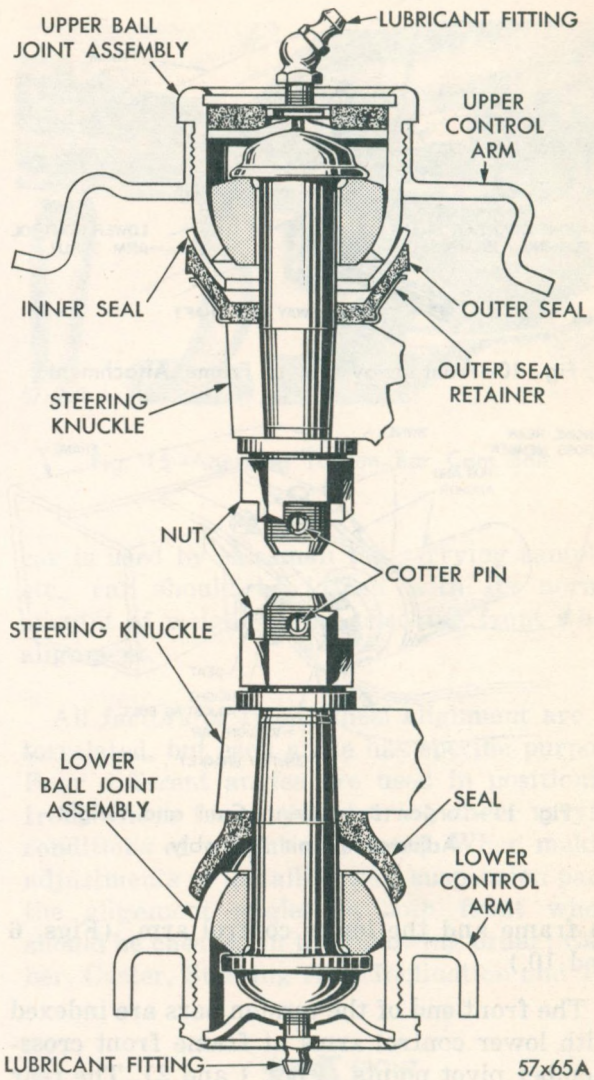

Fig. 8—Upper and Lower Steering Knuckle Ball Joint Assembly

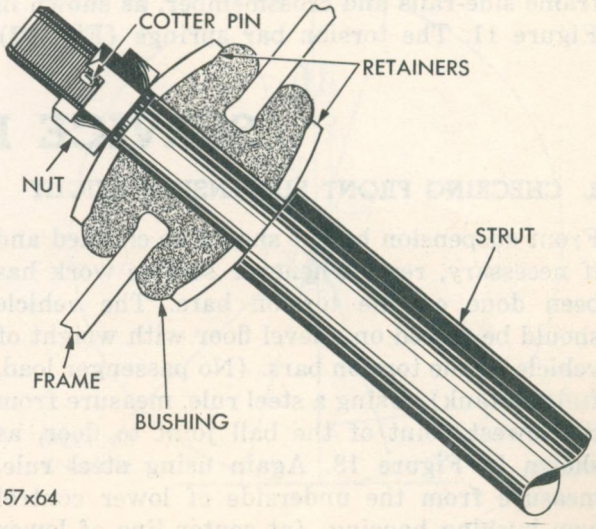

Fig. 9—Front Strut Bar Bushing Assembly

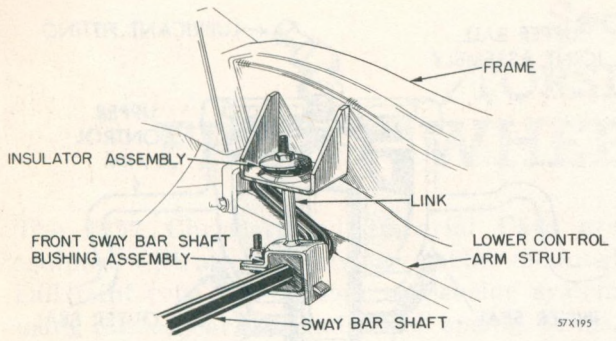

Fig. 10—Front Sway Bar to Frame Attachment

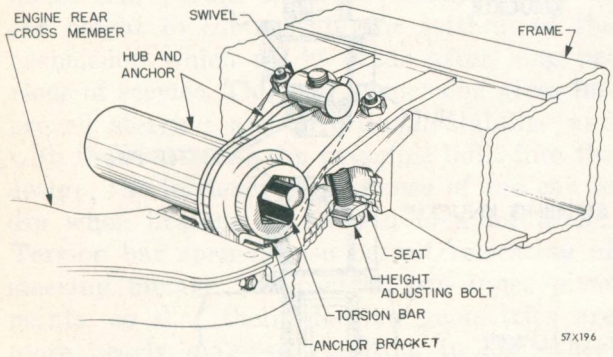

Fig. 11—Torsion Bar Spring Cam and Height Adjustment Bolt Assembly

to frame and the lower control arm. (Figs. 6 and 10.)

The front end of the torsion bars are indexed with lower control arms at frame front crossmember pivot points (Figs. 1 and 2). The rear end of torsion bars are indexed in anchors which are supported by brackets welded to frame side-rails and crossmember, as shown in Figure 11. The torsion bar springs (Fig. 12) are marked (L) and (R) in manufacture and are not interchangeable.

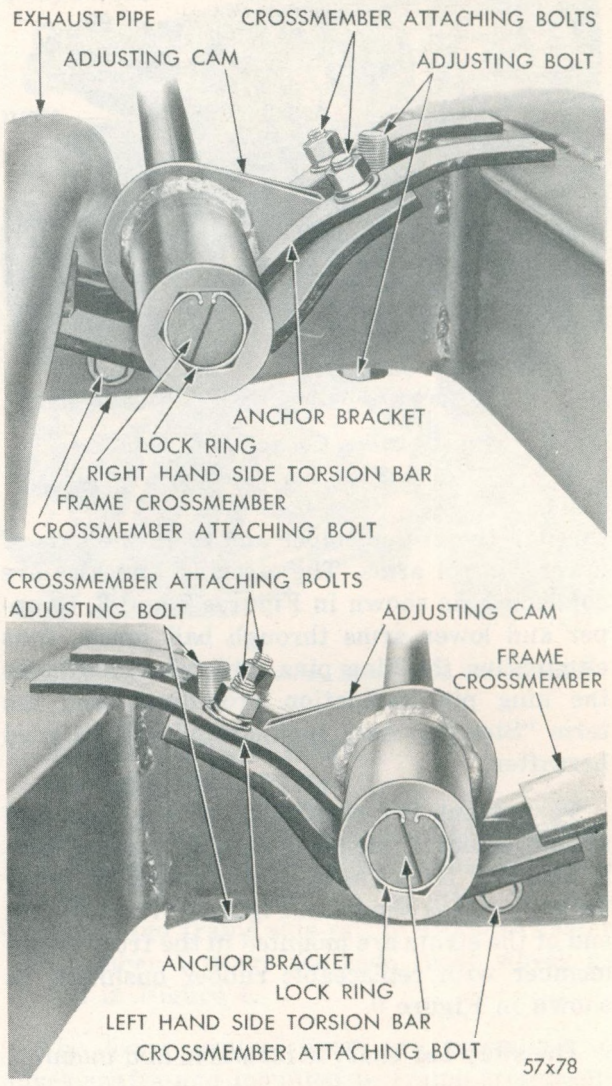

Fig. 12—Torsion Bar Spring (Rear Mounting)

SERVICE PROCEDURES

2. CHECKING FRONT SUSPENSION HEIGHT

Front suspension height should be checked and if necessary, reset whenever service work has been done on the torsion bars. The vehicle should be placed on a level floor with weight of vehicle on the torsion bars. (No passenger load, full gas tank). Using a steel rule, measure from the lowest point of the ball joint to floor, as shown in Figure 13. Again using steel rule, measure from the underside of lower control arm bushing housing, (at center line of lower control arm), as shown in Figure 14. **Under car weight, the bushing housing will always be higher than the ball joint housing.** The difference between these two points should be held to $2\frac{3}{16}$ inches plus or minus $\frac{1}{16}$ inches. Check measurements on the opposite side of car in same manner. After the differential measurements have been established for each side, they should be compared. **The results must be held within $\frac{1}{8}$ inch of each other.**

NOTE: Jounce front of car and allow it to find its free height before checking.

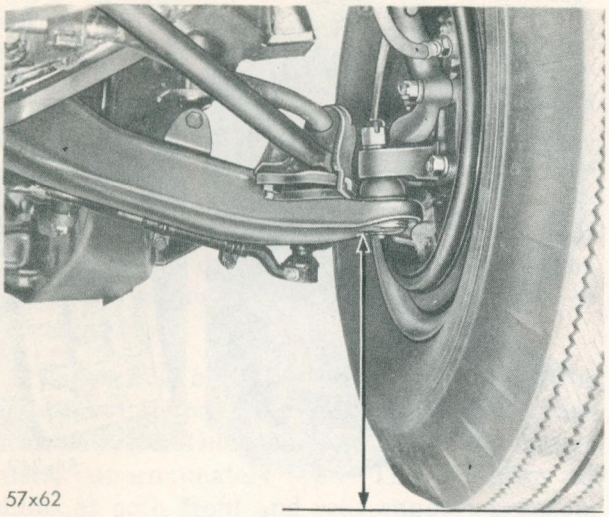

Fig. 13—Measuring Front Spring Height

Make correction by tightening or loosening the adjusting bolt at torsion bar anchor, (Fig. 15) until correct height has been obtained. **When front suspension height has been changed by adjustment, check alignment of front wheels, and aiming of headlight beam. Adjust as necessary.**

3. FRONT WHEEL ALIGNMENT (CASTER AND CAMBER)

Correct front wheel alignment produces easy, positive steering with a minimum of scuffing action between tire and load. Normally, when checking front wheel alignment, car should be empty (all luggage or load should be removed). If a constant load is carried, such as when a car is used by salesman for carrying samples, etc., car should be loaded with its normal amount of weight before checking front wheel alignment.

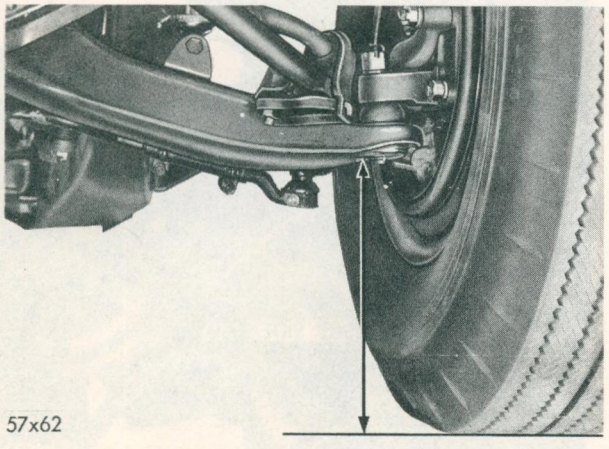

Fig. 14—Measuring Front Spring Height at Control Arm

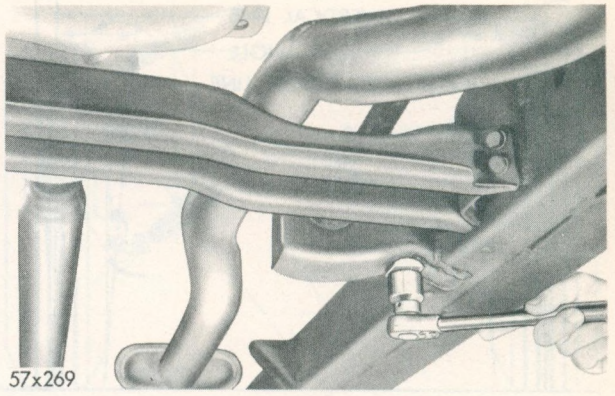

Fig. 15—Adjusting Torsion Bar Cam Bolt

All factors of front wheel alignment are interrelated, but each angle has specific purpose. Four different angles are used in positioning front wheels for proper steering under varying conditions of weight and speed. When making adjustments or installing new suspension parts, the alignment angles in both front wheels should be checked in the following order: Camber, Caster, Steering Axis Inclination and Toe.

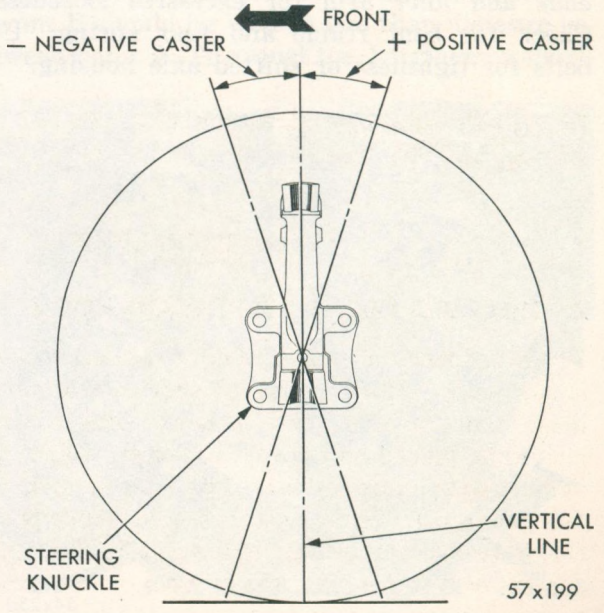

Fig. 16—Caster Angle

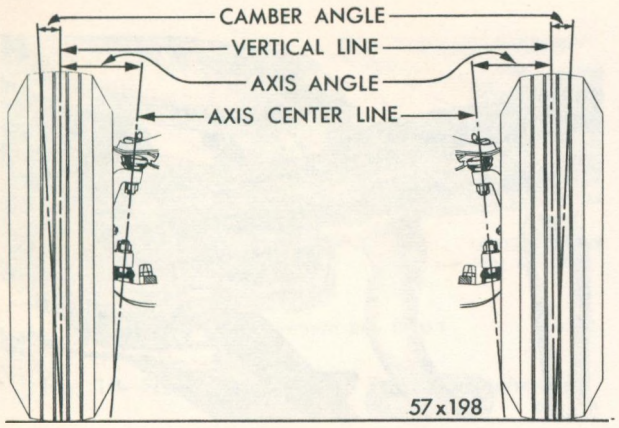

Fig. 17—Camber Angle Axis Inclination

NOTE: Front suspension parts are heat treated, if they are damaged or bent, they should be replaced. Under no circumstances should these parts be heated in order to straighten.

Before checking front wheel alignment, the following inspections should be made to determine the necessity for repair or replacement of parts.

Inflate all tires to recommended pressure. Check adjustment of front wheel bearings. (Refer to "Servicing the Steering Knuckles" Paragraph 8, of this Section.) Check tire wear as outlined in "Wheels and Tires" Section XIII.

Check upper and lower ball joints, tie rod ends and idler arm for excessive looseness. Check for bent frame and rear spring "U" bolts for tightness or shifted axle housing.

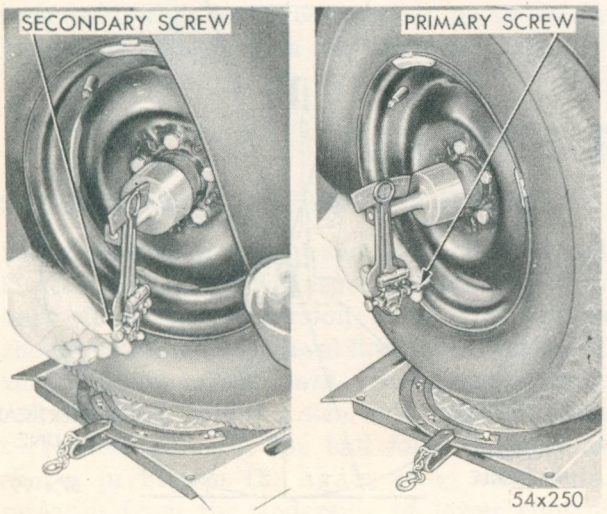

Fig. 18—Checking Caster—Right Wheel

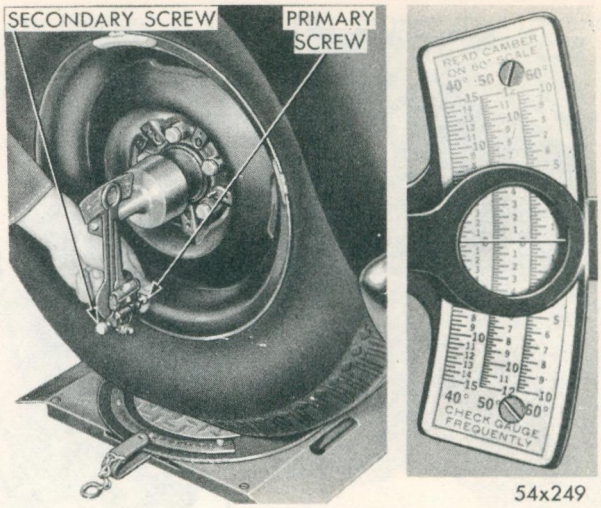

Fig. 19—Checking Camber (Tool C-3409)

Grasp the front and rear bumper at center and jounce car up and down several times. This will place the torsion bar springs and shock absorbers in their "normal" unloaded position. **The car must remain in the "normal unloaded position" while checking camber, caster and steering axis inclination.**

Negative Caster is amount in degrees that the axis of the ball joint leans from vertical toward front of car (Fig. 16).

Positive Caster is the amount of degrees that ball joints lean toward rear of car.

Camber is amount that front wheels lean outward or inward from the vertical, when viewed from front of car (Fig. 17). With positive cam-

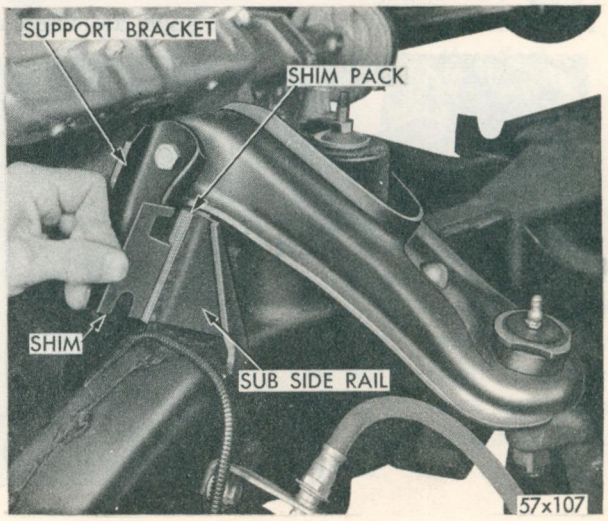

Fig. 20—Removing Shims to Adjust Camber or Caster

ber, wheels are farther apart at top than at bottom. With negative camber, this condition is reversed.

Caster and camber adjustment (Figs. 18 and 19) is accomplished by the use of 1/16 and 1/32 inch shims placed between the upper control arm support brackets and the frame sub side-rails. (Refer to Fig. 20). Shim may be changed at either front or rear bracket to change the caster setting or equally at both brackets to change camber.

The removal of shims at the rear bracket or addition of shims to front bracket will decrease positive caster. One shim (1/16 inch) will change caster approximately 3/8°. The addition of shims at both front and rear support brackets will decrease positive camber. One shim (1/16 inch) at each bracket will change camber (approximately) 1/8°. Caster and camber adjustments are made as follows:

Remove load from upper control arms and frame bracket by placing a jack under lower control arm as near to the front wheel as possible. Raise car off floor. Loosen upper control arm support bracket bolts and add or remove shims as required, as shown in Figure 20. Retighten bolts, remove jack and bounce front of vehicle to allow car to assume its normal operating position before checking wheel alignment.

The total thickness of the shim pack at either of the support brackets should **NOT** exceed 9/16 inch.

4. ADJUSTING FRONT WHEEL TOE-IN

Toe-In means that wheels are closer together

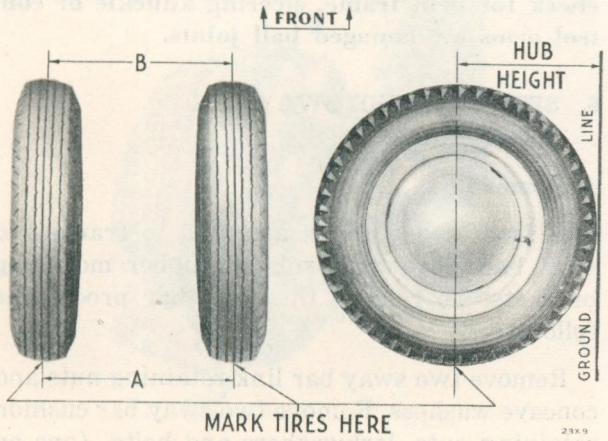

Fig. 21—Front Wheel Toe-in

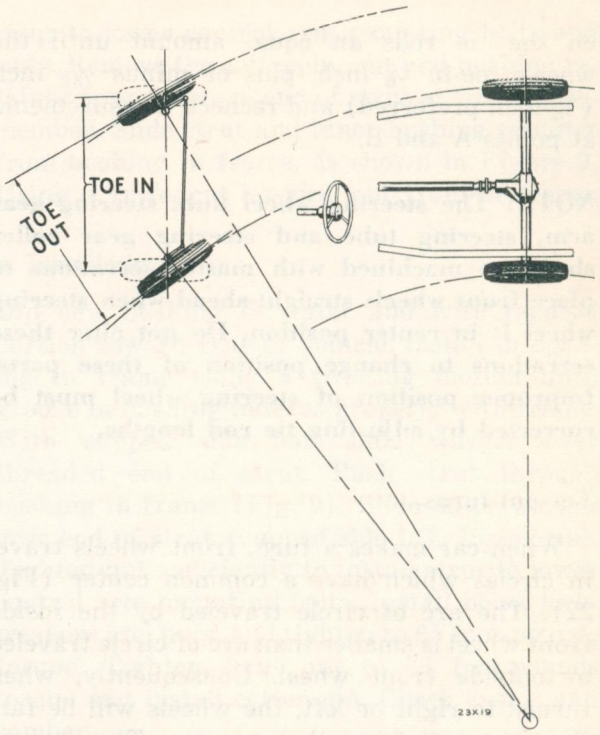

Fig. 22—Steering Geometry on Turns

at front than they are at rear. To measure, spin front wheels and scribe a thin line in center of tread of each tire (Fig. 21). Jounce front end up and down several times and position wheels in straight-ahead position. Gauge and scriber Tool C-695 can be used for scribing tire treads and measuring toe.

Measure distance at hub height between points A and B, Fig. 21. The distance between point B should be 1/8 inch less than distance between point A. To adjust toe, lengthen or short-

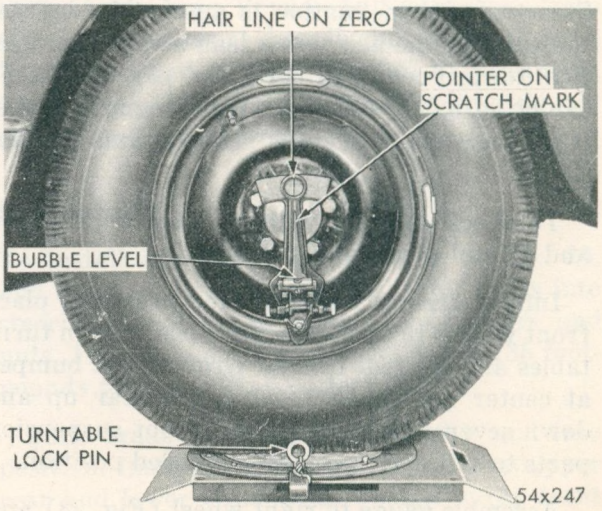

Fig. 23—Gauge C-3409 and Turntable DD 435 on Right Wheel

en the tie rods an equal amount until the wheels toe-in 1/8 inch, plus or minus 1/32 inch (1/8 inch preferred) and recheck measurements at points A and B.

NOTE: The steering wheel hub, steering gear arm, steering tube and steering gear roller shaft are machined with master serrations to place front wheels straight-ahead when steering wheel is in center position. Do not alter these serrations to change position of these parts. Improper position of steering wheel must be corrected by adjusting tie rod lengths.

Toe-out turns.

When car makes a turn, front wheels travel in circles which have a common center (Fig. 22). The arc of circle traveled by the inside front wheel is smaller than arc of circle traveled by outside front wheel. Consequently, when turned to right or left, the wheels will be farther apart at front than at rear. The amount that front wheels toe-out depends upon how far they are turned.

With front wheels on turntables, set right wheel to 20 degrees. The turntable under left wheel should indicate 21½ degrees, plus or minus 1 degree. If reading is not within these limits, the steering knuckle arm or steering gear arm may be bent. Before above check is made, make sure that camber, caster, steering axis inclination and toe-in are within limits.

5. CHECKING STEERING AXIS INCLINATION

Steering axis inclination is amount in degrees that axis of the ball joints lean away from vertical toward center of car (Fig. 16). If camber can be adjusted within the recommended limits, it is unnecessary to check steering axis inclination.

To check axis inclination refer to Figs. 16 and 17 and proceed as follows:

Inflate tires to recommended pressure, place front wheels in straight-ahead position on turntables and set foot brakes. Grasp front bumper at center and move front end of car up and down several times to permit front suspension parts to settle in "normal" unloaded position.

Assemble gauge to right wheel (Fig. 23) and pull out turntable lock pins. Turn front wheels to left until right wheel has turned more than

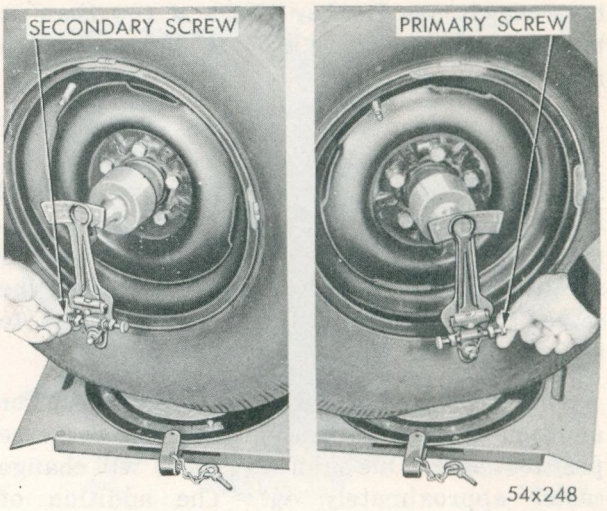

Fig. 24—Checking Steering Axis Inclination (Gauge C-3409)

20 degrees then return to 20 degrees. Adjust secondary screw (Fig. 24). which controls the short pointer until bubble is centered in spirit level. **Do not disturb gauge setting or release brakes.**

Turn front wheels to right until right wheel is turned to an angle of more than 20 degrees mark. Allow wheel to back off to exactly 20 degrees. Adjust primary screw (Fig. 24) until bubble centers in spirit level. The reading on 40-degree scale of gauge will be steering axis inclination for right wheel.

To check angle of left front wheel, place gauge on left wheel, turn front wheels to right and repeat procedure outlined above.

NOTE: If the steering axis inclination does not conform with limits listed in Specifications, check for bent frame, steering knuckle or control arms or damaged ball joints.

6. SERVICING THE SWAY BAR (FIGS. 6 and 10)

a. Removal

The front sway bar is attached to frame and strut bars through insulated rubber mounting brackets. To remove the sway bar proceed as follows:

Remove two sway bar link retaining nuts and concave washers. Remove two sway bar cushion retaining nuts, lockwashers and bolts, (one on each strut). Slide sway bar out through con-

trol arm struts and away from vehicle. **The sway bar cushions are not serviced separately. If replacement is necessary, install new sway bar assembly.**

Remove lower concave washers. Remove sway bar link insulating bushings from frame bracket by forcing out of position. If bushings are worn or deteriorated, install new ones as required.

b. Installation

Dip new sway bar link bushing in water, install in opening in frame bracket, using a twisting motion. When installed properly, the groove in bushing will index with opening in frame bracket.

Thread sway bar into position over top of lower control arm struts. Engage sway bar cushion housings with struts and install lockplates. Insert bolts, lockwashers and nuts. Tighten to 25 foot-pounds torque. Install washers over ends of links (concave side up), then slide links up through bushings. Install washers (concave side down), over ends of links and down on bushings. Install nuts and tighten to 15 foot-pounds torque.

7. SERVICING THE LOWER CONTROL ARM STRUT (FIGS. 6 and 9)

a. Removal

Remove the nuts, lockwashers, and bolts that attach the sway bar bushing housing to struts. Disconnect sway bar from struts. Remove the strut to lower control arm mounting bolts and nuts. Remove the cotterpin, nut and bushing retainer from forward end of strut at front crossmember. Slide strut and inner bushing retainer from bushing in frame, as shown in Figure 9. Using a knife, cut bushing out front of frame.

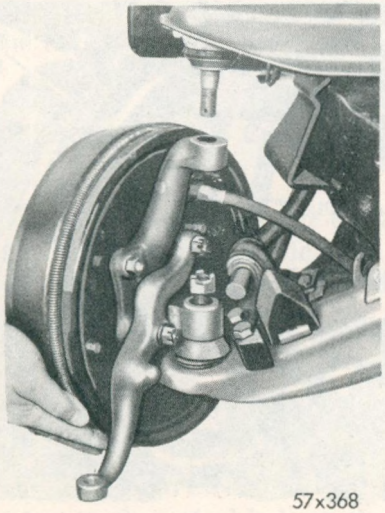

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Fig. 25—Removing or Installing Steering Knuckle

b. Installation

Dip new bushing in water and with tapered portion toward rear of vehicle, install in opening in frame using a twisting motion until groove in bushing indexes properly with frame. With cupped side out, slide washer over threaded end of strut. Push strut through bushing in frame (Fig. 9). Slide outer washer over end of strut (cupped side in). Install nut. Tighten nut sufficiently to install strut to lower control arm mounting bolts. Install bolts, lockwashers and nuts, and tighten to 65 foot-pounds torque. Tighten strut nut to 30 foot-pounds torque and install cotter pin. Check caster and camber.

8. SERVICING THE STEERING KNUCKLES (FIG. 25)

a. Removal

Remove wheel, tire and drum. Cover brakes with clean cloth to protect lining from becoming covered with grease. Remove the cotterpins, nuts and lockwashers attaching the steering arm and brake dust shield to steering knuckle. Remove steering arm, and brake assembly from steering knuckle but leaving the brake hose attached. Do not allow assembly to hang by the brake hose. Remove ball joint studs from steering knuckles as described in "Servicing the Upper and Lower Ball Joints," Paragraph 9, using Tool C-3564. Lift steering knuckle out and away from vehicle.

b. Installation

To install steering knuckle, refer to Fig. 25, and slide upper and lower ball joint studs into steering knuckle and install lockwashers and nuts. Tighten the ball joint stud nut to 135 foot-pounds torque. Install cotterpins.

Slide brake assembly over knuckle and into position. Install lockwashers and nuts on upper rear and lower front bolts. Install upper front and lower rear bolts through dust shield and steering knuckle, then slide steering arm over

bolts. Install lockwashers and nuts. Tighten nuts evenly to 55 foot-pounds torque. Install cotterpins. Remove covering from brake shoes, replace wheel, tire and drum assembly. Adjust front wheel bearings as per "Front Wheel Bearing End Play Adjustment", Paragraph 16. Refer to "Front Wheel Alignment (Caster and Camber)", Paragraph 3.

9. SERVICING THE BALL JOINTS—(UPPER AND LOWER) (FIGS. 26 and 27)

a. Removal of Upper Ball Joint

CAUTION

Upper and lower ball joints are not interchangeable. The upper ball joint is a preloaded joint and should not be used in the lower control arm.

Remove wheel and tire assembly. With support under the lower control arm, remove upper and lower ball joint stud nuts. Install Tool C-3564 (Fig. 26). Apply load to studs and rap knuckles at ball joint boss sharply with a hammer to loosen stud. **To avoid damaging stud do not attempt to hammer stud out of knuckle.**

Remove tool, and disengage ball joint from knuckle. Remove ball joint dust cover and grease seal. Remove lubrication fitting from top of ball joint, using Tool C-356, as shown in Figure 27, unscrew ball joint from upper control arm.

b. Installation of Upper Ball Joint

NOTE: When installing new ball joint, it is very important that the ball joint threads engage those of the control arm squarely.

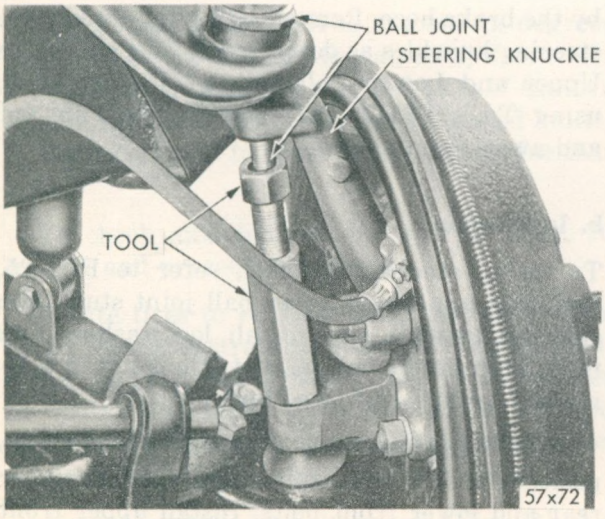

Fig. 26—Removing Upper Ball Joint—(Removal Tool C-3564)

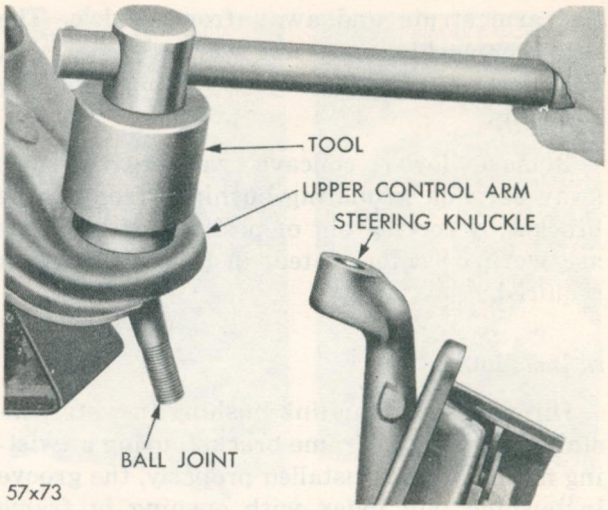

Fig. 27—Removing or Installing Upper Control Arm Ball Joints

With the lubrication fitting removed, screw ball joint into control arm as far as possible by hand. Using Tool C-3461, tighten until ball joint housing is seated on control arm. Tighten to a minimum of 250 foot-pounds torque. Slide seal and dust cover up into position, over stud and position stud in steering knuckle. Install washer and nut. Tighten 135 foot-pounds torque. Install cotter pin and lubrication fitting. Lubricate ball joint with a good grade of chassis lubricant.

c. Removal of Lower Ball Joint

Raise wheel off floor supporting weight under

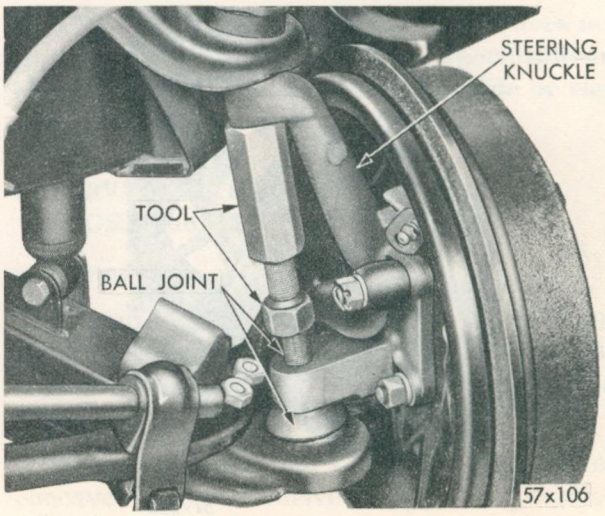

Fig. 28—Removing Lower Ball Joint

the lower control arm, allowing enough clearance to remove lower ball joint, and remove wheel and tire assembly. Remove upper and lower ball joint stud nuts, install Tool C-3564 (Fig. 28) as described in "Upper Ball Joint Removal" Paragraph 9 procedure. Rap knuckle at stud boss sharply with a hammer to loosen stud. **To avoid damaging stud do not attempt to hammer stud out of knuckle.** Remove grease fitting using Tool C-3561, screw out ball joint.

NOTE: When installing new ball joint, it is very important that the ball joint threads engage those of the control arm squarely.

d. Installation of Lower Ball Joint

To reinstall, screw ball joint into control arm as far as possible by hand. Using Tool C-3561, tighten until ball joint housing is seated on control arm. Tighten to minimum of 250 foot-pounds torque. Slide seal and dust cover down into position, over stud then position stud in steering knuckle. Install washer and nut. Tighten 135 foot-pounds torque. Install cotterpin; lubrication fitting and lubricate ball joint, using a good grade of chassis lubricant and reinstall wheel and tire assembly.

10. SERVICING THE TORSION BARS

The torsion bars are not interchangeable, side for side. The left hand bar cannot be used on the right side and vice versa. The bars will be marked left or right by (L) or (R) stamped on the end of the rod, as shown in Figure 12. The bars should always be installed with letters toward the rear of car.

a. Removal of Torsion Bar, Cam Swivel and Bolt

To replace torsion bar cam, refer to Fig. 2 and proceed as follows: Raise vehicle off floor by jacking under frame crossmember. Release load from torsion bar by unscrewing the cam adjusting bolt partly out of swivel.

CAUTION

To prevent swivel from falling into frame bracket, do not loosen the swivel bolt all the way out until torsion bar is removed.

Remove the lock ring from rear of anchor (Fig. 12). Slide torsion bar rearward enough to disengage forward end of bar from lower control arm, then forward to disengage torsion bar from cam. Remove bar, bolt, swivel and cam from frame bracket anchor.

b. Installation

With car raised off the floor, assemble cam, swivel, bolt-seat (oval side up) and bolt in frame anchor bracket. Check for torsion bar cushion in lower control arm housing, with cam bolt barely entered in cam swivel. Slide torsion bar into rear cam. Rotate cam and torsion bar assembly until cam is positioned as close as possible to floor pan. Engage front of torsion bar in lower control arm shaft assembly as far as bar will go.

CAUTION

Unless anchor blade is in the position just described when installing torsion bar, it will be impossible to adjust front suspension to the proper suspension height.

Center and install lock ring in rear of cam housing. Pressure may have to be applied to torsion bar to enable lock ring to be installed in housing. After installation of lock ring, tighten cam bolt until approximately 1 inch of threads are showing above the anchor bolt swivel.

NOTE: This is an approximate setting and is to be used merely as a starting point when adjusting suspension height. This setting is also necessary to place load on the torsion bar spring before lowering vehicle to the floor.

Check and adjust suspension height. Refer to "Checking Front Suspension Height", Paragraph 2.

CAUTION

Caster and camber and front suspension height should always be checked whenever the torsion bars are replaced.

Refer to "Checking Front Spring Height", Paragraph 2 of this section.

11. SERVICING THE UPPER CONTROL ARM

a. Removal (FIG. 2)

Place a jack under lower control arm and raise front wheel off floor. Remove wheel and tire assembly. Remove cotter pin, nut, and washer from upper ball joint stud. Install tool and load studs. Using a hammer, remove ball joint stud from steering knuckle by striking the ball joint boss on knuckle sharply. Do not hammer on threaded section of stud.

Remove upper control arm front and rear pivot bolt. Remove control arm from support mountings. Do not remove brackets from frame.

b. Installation

Position upper control arm in support mounting bracket and install front and rear mounting bolts, washers, and nuts. With control arm in normal position tighten nuts to 65 foot-pounds torque. Place upper ball joint stud in steering knuckle and install washer and nut. Tighten nut to 135 foot-pounds torque and secure with cotterpin.

12. UPPER CONTROL ARM BUSHING—REPLACEMENT

Remove upper control arm. Refer to "Upper Control Arm—Removal", operations 1 through 7.

Remove bushings by either pressing them out with Tool C-3558 (Fig. 29) or using a hammer and suitable drift.

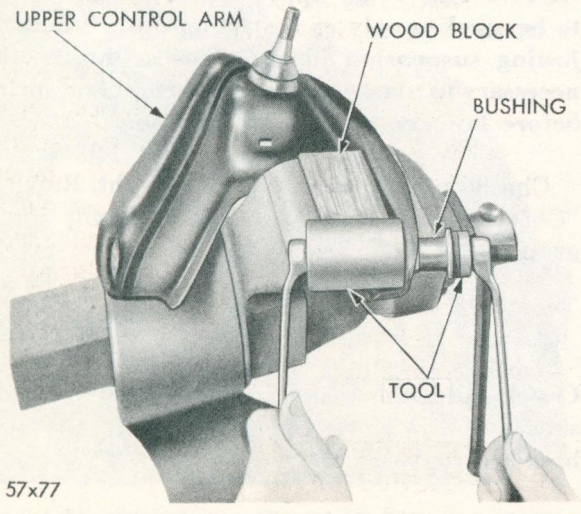

Fig. 29—Removing Upper Control Arm Bushing

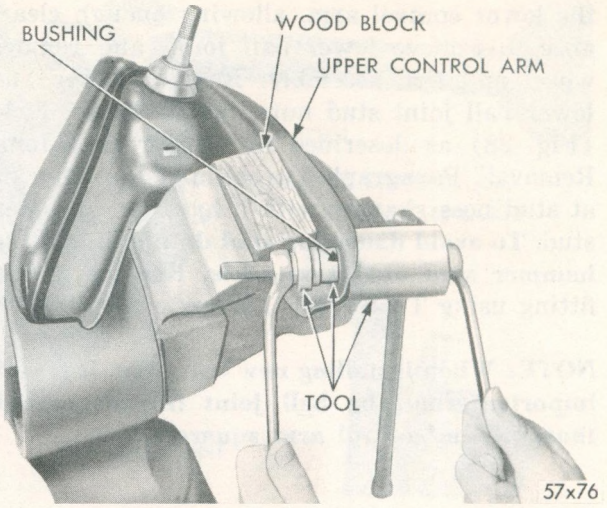

Fig. 30—Installing Upper Control Arm Bushing

NOTE: Make definitely sure control arm is properly supported when removing bushings. If hammer and drift are used, extreme care must be exercised to avoid damaging bushing surface in the control arm.

When installing new bushings, always make sure control arm is supported squarely at the point bushing is being pressed in. Position flange end of new bushing in Tool C-3558 (Fig. 30), and support control arm squarely. Using an arbor press, install bushings (flange out) into control arm until the flanged portion of bushings seat on arm.

Install upper control arm. Refer to "Control Arm—Installation", operations 1 through 3.

13. LOWER CONTROL ARM

a. Removal

Raise car by placing jack under frame crossmember. Remove wheel and tire assembly. Remove torsion bar spring from lower control arm to be removed. Refer to "Servicing Torsion Bar —Removal", Paragraph 10. Remove shock absorber lower eye attachment nut and bolt from mounting bracket. Push lower portion of shock absorber up into frame opening. Remove the two strut to lower control arm mounting bolts and nuts. Remove cotter pin, nut, and washer from lower ball joint stud. Remove lower ball joint stud from knuckle (Refer to Paragraph 9 (a). Remove cotter pin, nut and washer from lower control arm shaft assembly. With washer

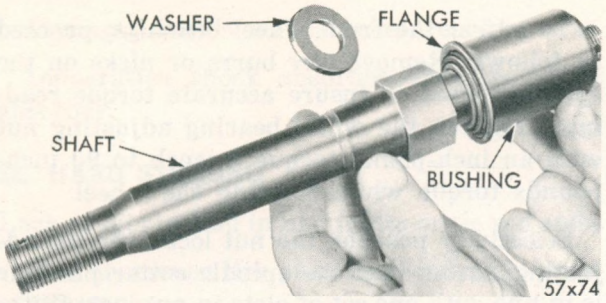

Fig. 31—Removing or Installing Lower Control Arm Pivot Shaft Bushing

removed, reinstall nut (to protect threads) until it is flush with end of shaft. The lower control arm shaft is a tapered fit in front crossmember. Use a hammer and brass drift for loosening, then remove nut from shaft. Slide lower control arm and shaft assembly from rear of crossmember.

CAUTION

Do not lose torsion bar spring cushion (small disc located in end of shaft assembly).

b. Installation

Position shaft and lower arm assembly in crossmember in normal position; and install washer and nut. Tighten 175 to 200 foot-pounds torque and secure with cotter pin. Position lower ball joint stud in steering knuckle and install washer and nut. Tighten nut 135 foot-pounds torque and secure with cotter pin. Place shock absorber in position in lower mounting bracket and install bolt and nut. Tighten to 40 foot-pounds torque. Install wheel and tire assembly. **Do not lower front of vehicle at this time.** Install torsion bar spring. Refer to "Servicing Torsion Bar Installation", Paragraph 10.

14. LOWER CONTROL ARM PIVOT SHAFT BUSHING—REPLACEMENT (FIGS. 31 and 32)

Remove lower control arm assembly. Refer to "Lower Control Arm—Removal", Paragraph 13. Remove torsion bar spring cushion (small disc) from end of shaft assembly.

a. Disassembly

Remove lock ring from end of bushing housing. Support lower control arm assembly in an arbor press; and using a brass drift, press shaft and bushing assembly from control arm. Remove cotter pin, nut, and washer; and slide bushing assembly from shaft.

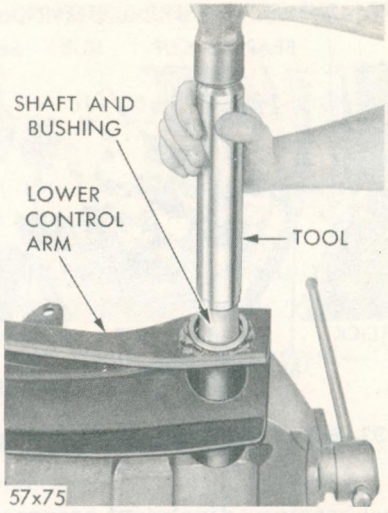

Fig. 32—Installing Lower Control Arm Pivot Bushing

b. Assembly

Position new bushing (flanged end of bushing first) on shaft and install washer and nut. Tighten nut 100 to 150 foot-pounds torque and install cotter pin.

With lower control arm supported, install shaft and bushing assembly by using Tool C-3557 and pressing bushing into the lower control arm until flanged portion of bushing is seated all the way into control arm. Install lock ring making sure it is seated properly in the ring groove. Install torsion bar spring cushion in control arm. Install lower control arm. Refer to "Lower Control Arm—Installation", Paragraph 13.

15. UPPER CONTROL ARM SUPPORT MOUNTING BRACKETS

The upper control arm support mounting brackets are bolted to the frame side-rails and should not be removed unless they have been damaged due to accident, etc. When removing the mounting brackets, extreme care should be taken so not to lose the alignment shim pack located between the bracket and frame side-rail. In event a shim pack is lost, a selection of shims 5/16 inch thick **may be used as a starting point** when reassembling.

16. FRONT WHEEL BEARING END PLAY ADJUSTMENT

A new front wheel bearing adjusting nut and lock is used on the 1957 cars to provide greater

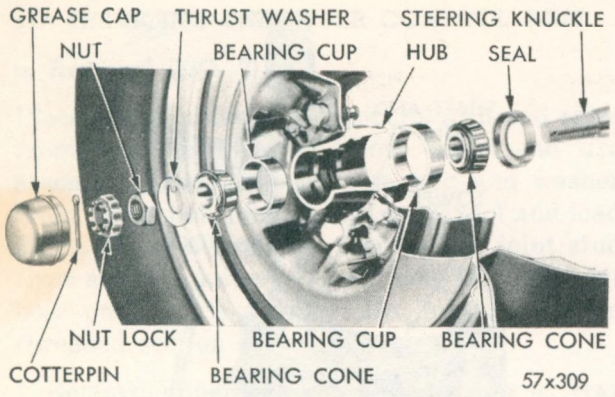

Fig. 33—Front Wheel Bearing Adjustment

front wheel bearing adjustment accuracy. (Fig. 33).

To adjust the front wheel bearings, proceed as follows: Remove any burrs or nicks on the spindle thread to insure accurate torque readings. Tighten the wheel bearing adjusting nut with an inch-pound torque wrench to 90 inch-pounds torque while rotating the wheel.

Selectively position the nut lock over the adjusting nut so that the spindle cotter pin hole is in line with one set of slots in nut lock. Without removing the nut lock, back off the nut until the next set of slots in nut lock is lined up with spindle cotter pin hole. Insert and bend the cotter pin to secure the nut lock.

NOTE: This procedure should result in from .000 inch (no pre-load) to .003 inch bearing free play measured axially.

SERVICE DIAGNOSIS

17. FRONT END NOISY—POSSIBLE CAUSES AND CORRECTIONS

Lack of lubrication in ball joints or tie rod ends.

Worn upper or lower control arm pivot bushings (rubber) or loose mounting brackets—Tighten brackets or replace bushings.

Loose or worn strut mounting bushings (rubber)—Tighten mounting nut to proper torque or replace bushing.

Worn ball joints or tie rod ends—Replace as necessary.

Front shock absorber noisy—Tighten mounting nuts or replace bushing or shock absorber as required.

Sway eliminator noisy—Check attaching bolts for tightness and rubber bushings for wear. If rubber bushings are worn, replace sway eliminator assembly.

Worn or loose front wheel bearings—Adjust or replace as required.

18. BODY HAS TENDENCY TO PITCH AND ROLL

Low or uneven tire pressures—Inflate tires to proper pressure.

Shock absorber inoperative—Replace as required.

Loose sway eliminator—Tighten mounting bolts to proper torque.

Improper front suspension height—Adjust torsion bar springs as required.

19. TIRE WEAR

The same items which caused excessive tire wear in the previous suspension will also apply to the 1957 series suspension.

20. STEERING

The following is a list of steering problems which may be checked after it has definitely been established that difficulty is caused by the front suspension system.

21. WHEEL BOUNCE

Unequal tire pressure—Inflate tires to recommended pressure.

Unbalanced wheels tires or brake drums—A wheel and tire assembly that is out of static balance can cause an up and down action which will affect steering ability and control.

Damaged or in some instances, repaired tires.

Inoperative shock absorber—Replace shock absorber.

22. HARD STEERING

Lack of lubrication in ball joints or tie rod ends.

Low or uneven tire pressure—inflate to proper pressure.

Improper caster—Check and adjust front end alignment.

Upper or lower control arms bent or twisted —Replace as required.

Frame bent—Straighten frame and check alignment.

Bent steering knuckle—Replace as required.

23. EXCESSIVE PLAY OR LOOSENESS IN STEERING SYSTEM

Loose stabilizer—Tighten bolts to proper torque.

Worn or loose front wheel bearings—Replace or adjust as required.

Worn ball joints—Replace as required.

Worn upper or lower control arm bushings—Replace as required.

Worn tie rod ends—Replace as required.

24. FRONT WHEEL SHIMMY

Uneven tire pressure—Inflate to proper pressure.

Worn or loose front wheel bearings—Replace or adjust as required.

Inoperative shock absorber—Replace as required.

Worn ball joints or tie rod ends—Replace as required.

Worn upper or lower control arm bushings—Replace as required.

Loose or worn strut mounting bushings—Tighten to proper torque or replace bushings.

Incorrect front end alignment—Check and adjust front end alignment.

Loose or bent steering knuckle—Tighten or replace.

Wheels and tires out of balance—Balance wheels and tires.

Excessive wheel and tire runout—Correct as necessary.

25. CAR PULLS TO ONE SIDE

Low or uneven tire pressure inflate to proper pressure.

Rear wheels are not tracking with front wheels—Check alignment to determine cause and correct as necessary.

Brake dragging—Adjust brakes.

Inoperative shock absorber—Replace as required.

Incorrect front wheel alignment—Check caster, camber, and toe-in and adjust as required.

Bent upper or lower control arm—Replace as required.

Section II

REAR AXLE

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DATA AND SPECIFICATIONS

Rear Axle	C-75	C-76	IM-1-2-4
Type	Semi-Floating	Semi-Floating	Semi-Floating
Gear Type	Hypoid	Hypoid	Hypoid
Ring Gear Diameter	8.75″	8.75″	8.75″
Pinion Bearing	2	2	2
Type	Tapered Roller	Tapered Roller	Tapered Roller
Adjustment	Shim Pack	Shim Pack	Shim Pack
Differential Bearings	2	2	2
Type	Tapered Roller	Tapered Roller	Tapered Roller
Adjustment	Threaded Adjuster	Threaded Adjuster	Threaded Adjuster

REAR AXLE

DATA AND SPECIFICATIONS (Continued)

Rear Axle	C-75		C-76		IM-1, 2, and 4
Drive Gear Pinion	Matched Sets		Matched Sets		Matched Sets
Drive Gear Run-Out	.005″ Maximum		.005″ Maximum		.005″ Maximum
Drive Gear and Pinion Backlash	.006″ to .008″		.006″ to .008″		.006″ to .008″
Differential Side Gear Clearance	.0 to .008″		.0 to .008″		.0 to .008″
Axle Ratio	Std. Model	T & C Wgn.	Std.	T & C Wgn.	Standard
With Standard 3-Speed Trans.	3.73	3.91	—	—	—
No. Drive Gear	41	43	—	—	—
No. Drive Pinion Teeth	11	11	—	—	—
With Torque Flite	3.18	3.36	3.18	3.36	3.18
No. Drive Gear Teeth	35	37	35	37	35
No. Drive Pinion Teeth	11	11	11	11	11
Type Recommended	**Ex. Press. Hypoid**				**Ex. Press. Hypoid**
Summer	90				90
Winter	90				90
Extreme Cold	80				80
Capacity	3½ Pints				3½ Pints
Wheel Bearings					
Type	Tapered Roller				Tapered Roller
Adjustment	Select Shims				Select Shims
Axle End Play	.003″ to .008″				.003″ to .008″
Road Clearance (Full Load)	7.4″		7.4″		7.6″
T & C Wagon	7.4″		7.4″		—
Sedan	—		—		—
Tread (Rear)	59.62″		59.62″		60.35″
T & C Wagon	59.62″		59.62″		—
Sedan	—		—		—

SPECIAL TOOLS

Tool Number	Tool Name
C-637	Puller—Rear Axle Shaft and Inner Oil Seal
C-293	Puller Sets—Roller Bearing
C-406A	Wrench—Differential Bearing Adjusting
C-413	Driver—Axle Shaft Outer Bearing Cup
C-3339 or 430	Dial—Indicator Set
C-452	Puller—Companion Flange or Yoke
C-499	Puller—Axle Shaft
C-549	Puller—Utility
C-745	Sleeve—Rear Axle Oil Seal Outer
C-757	Installing Sleeve—Axle Shaft Oil Seal
C-758-D3	Gauge—Pinion Bearing Pre-Load and Cone Angle Setting
C-3281	Wrench—Companion Flange on Yoke Holding
C-839	Driver—Axle Shaft Inner Oil Seal
C-845 or C-319	Puller—Universal Wheel and Hub
C-3565	Driver—Axle Shaft Outer Seal
C-3566	Driver—Axle Shaft Outer Seal—End Brake Support
DD-996 or DD-955	Installing Sleeve—Pinion Bearing
DD-914-8	Ring—Medium Reducer (use with DD-914-89)
DD-921	Wrench—Differential Case Cap Remover and Installer
DD-993	Puller—Pinion Oil Seal
DD-999	Installing Tool—Companion Flange or Yoke
DD-1005	Driver—Differential Case Side and Cross Shaft Roller Bearing

TIGHTENING REFERENCE

	Foot-Pounds
Axle Shaft Nuts	145 (minimum)
Brake Support Plate to Housing Mounting Bolt Nuts	35
Differential Carrier to Axle Housing Bolt Nuts	45
Rear Axle Drive Gear Bolt Nuts	40
Differential Bearing Cap Bolts	90
Pinion Shaft Companion Flange Nut	240 (minimum)

Section II
REAR AXLE

1. DRIVE GEAR ASSEMBLIES

The rear axles (Figs. 1 and 2) are semi-floating type with two pinion differentials and hypoid drive gear and pinion. The drive gear and pinion on all models are serviced only in matched sets to insure smooth quiet operation.

Cleaning and inspection of parts after disassembly is very important. Metal chips not cleaned from housing after a failure may cause excessive part wear and future failures.

Bearing cones and cups should be carefullly checked for discoloration due to overheating,

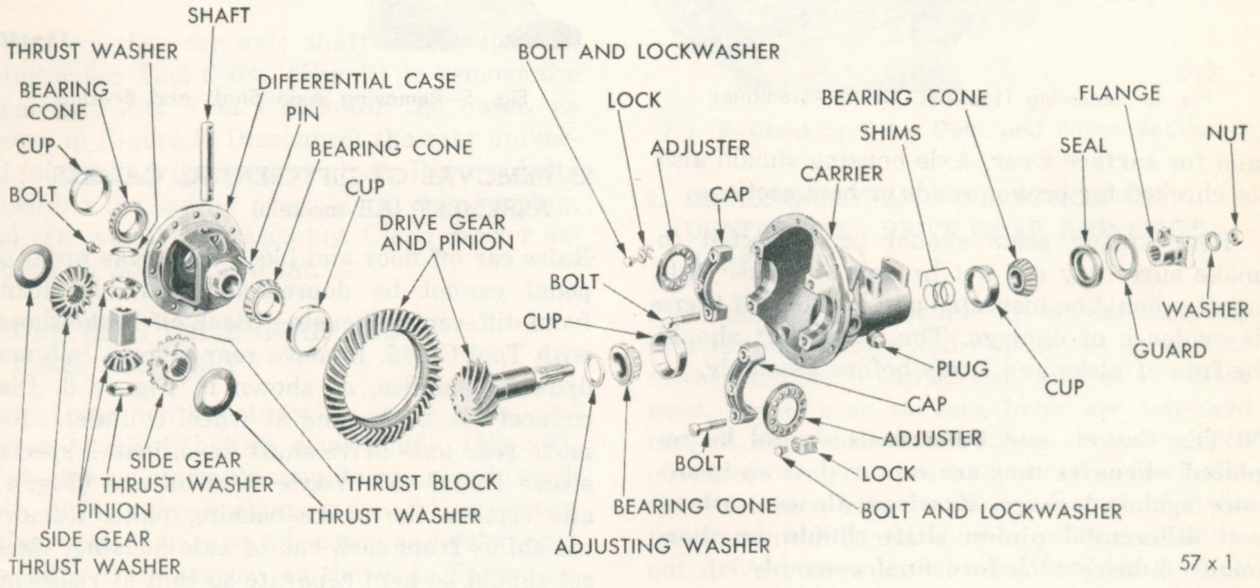


Fig. 1—Rear Axle Exploded View

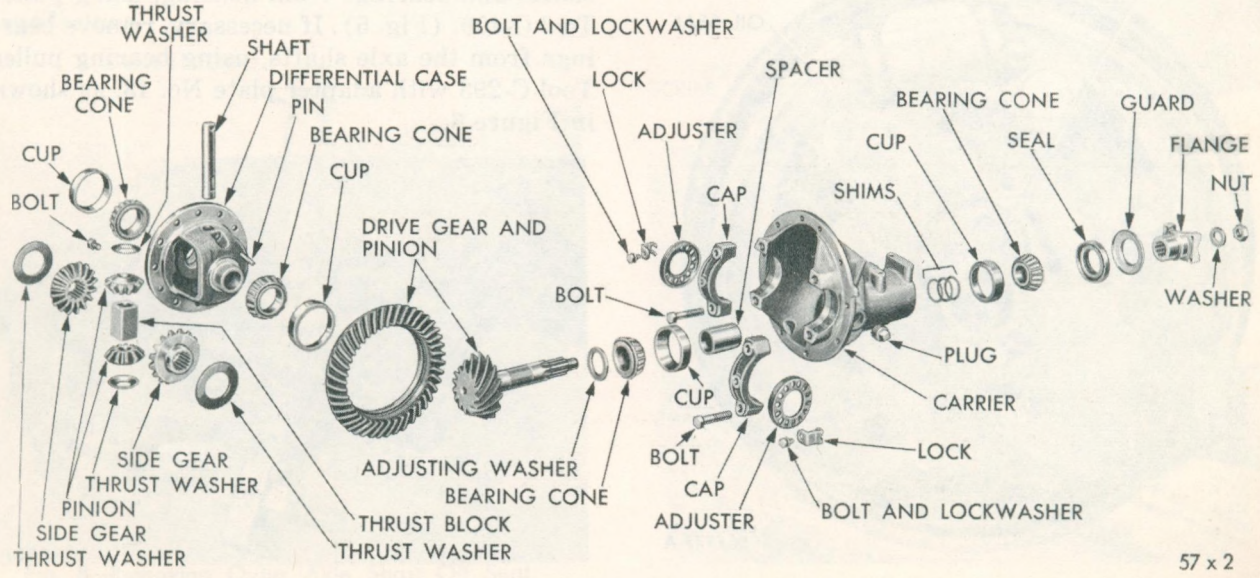


Fig. 2—Rear Axle Exploded View

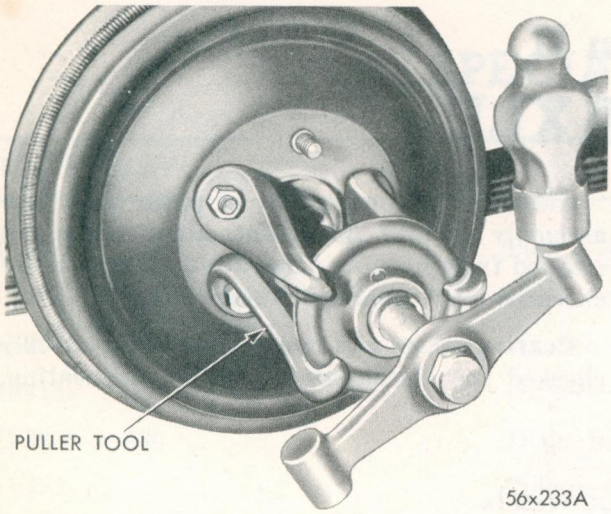


Fig. 3—Removing Hub and Drum Assemblies

and for surface wear. Axle housing should also be checked for broken welds or bent sections.

Rear spring seats should be inspected to make sure they are not broken or loose. Axle shafts should be inspected and replaced if there is evidence of damage. The axle shaft should be free of nicks and burrs before assembly.

NOTE: Gaskets and other seals should be replaced whenever they are removed as an insurance against leakage. Bearings, thrust washers and differential pinion shaft should be thoroughly lubricated before final assembly.

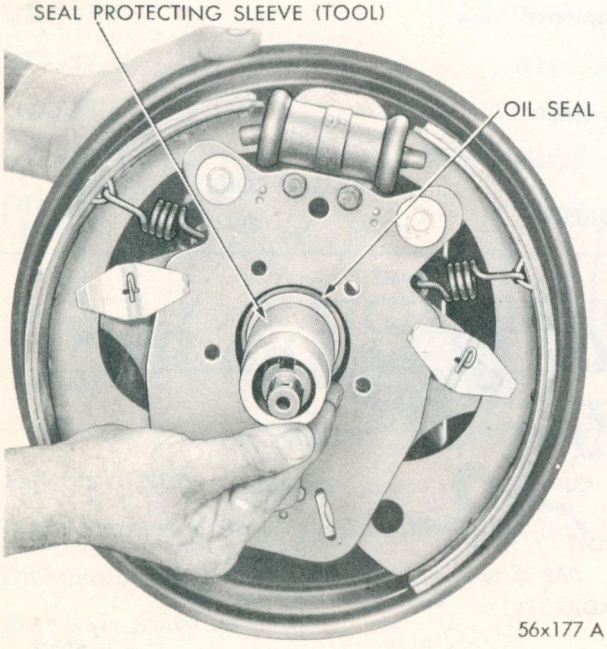


Fig. 4—Removing or Installing Protective Sleeve

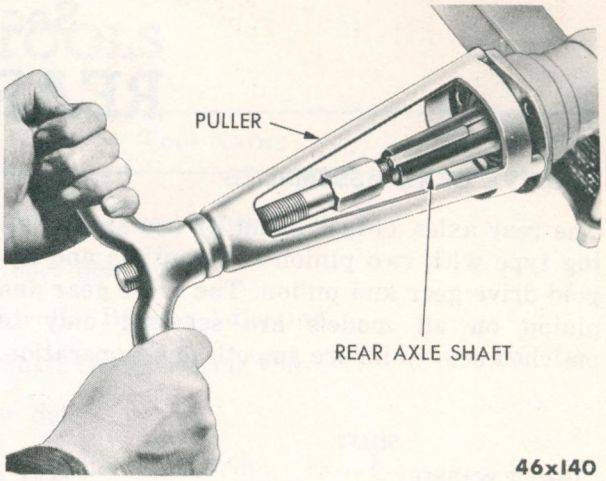


Fig. 5—Removing Axle Shaft and Bearing

2. REMOVAL OF DIFFERENTIAL CARRIER ASSEMBLY (All models)

Raise car off floor and block the brake pedal so pedal cannot be depressed. Drain lubricant from differential housing. Back off brake shoes, with Tool C-845. Remove rear wheels, hub and drum assemblies, as shown in Figure 3. Disconnect the brake line at wheel cylinders. Remove rear axle drive shaft keys, install special sleeve Tool C-757 in axle outer oil seal (Fig. 4) and remove the brake backing plate. Remove the shims from each end of axle housing. Each set should be kept separate so that at reassembly, the central location of the axle, shafts, and thrust block will be maintained. Remove axle shafts and bearings from housing, using puller Tool C-499. (Fig. 5). If necessary, remove bearings from the axle shafts, using bearing puller Tool C-293 with adapter plate No. 13, as shown in Figure 6.

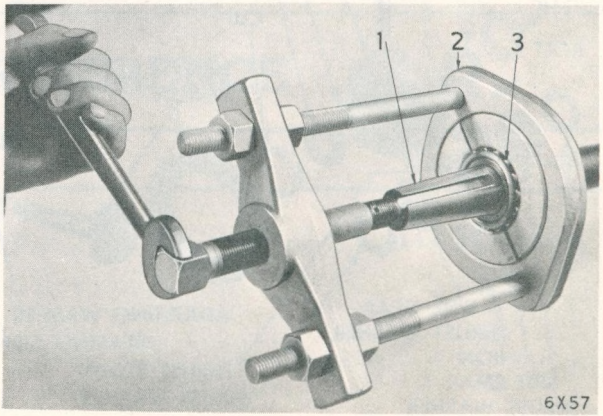


Fig. 6—Removing Bearing from Axle Shaft

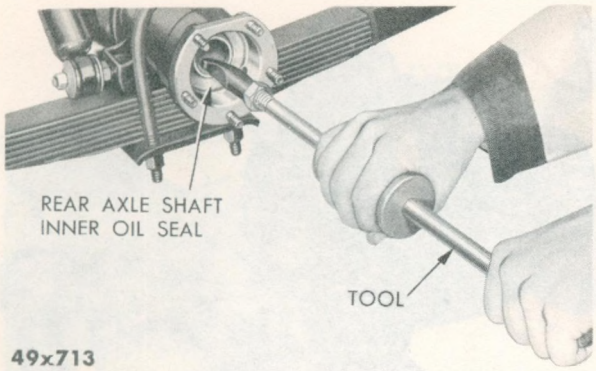


Fig. 7—Removing Inner Oil Seal Using Tool C-637

Remove the rear axle shaft inner oil seals, using puller Tool C-637 (Fig. 7) to remove the inner seal and Tool C-839 for the outer, as shown in Figure 8. Disconnect the rear universal joint and drop the prop shaft. Remove bolts attaching the carrier assembly to axle housing, and remove carrier assembly. Clean carrier assembly in suitable solvent.

3. CHECKING DRIVE GEAR AND CAGE ASSEMBLY

Check gear tooth pattern on drive gear, and pinion backlash before disassembly (Fig. 9). With carrier assembly mounted in stand, mark both differential bearing caps and adjusters, before removing caps, adjusters and drive gear assembly from carrier, as shown in Figure 10.

NOTE: The caps must NOT be interchanged as they are line bored with the carrier housing at manufacture.

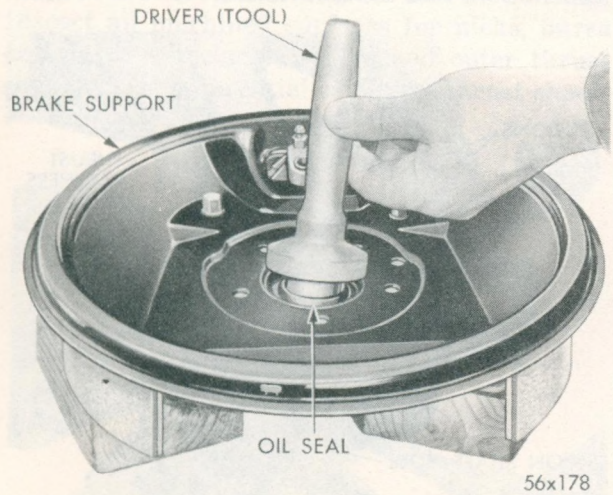


Fig. 8—Removing Outer Axle Shaft Oil Seal with Tool C-839

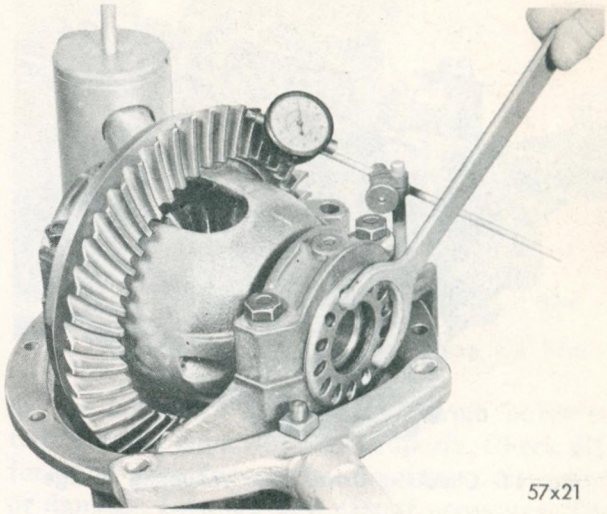


Fig. 9—Checking Drive Gear and Pinion Backlash

4. DISASSEMBLY AND INSPECTION OF DIFFERENTIAL DRIVE GEAR AND CAGE ASSEMBLY

Place differential case and drive gear assembly in a suitable fixture and remove the drive gear to case attaching cap screws and remove drive gear. **Drive gear to case bolts are left-hand threads, turn clockwise to loosen.** Tap ring gear off case, using a fibre hammer. To check differential case runout after removal of drive gear, mount differential case and bearings without drive gear in carrier and adjust. Remove excessive play from the bearings with adjusters. Mount a dial indicator on carrier mounting face and check the drive gear mounting flange

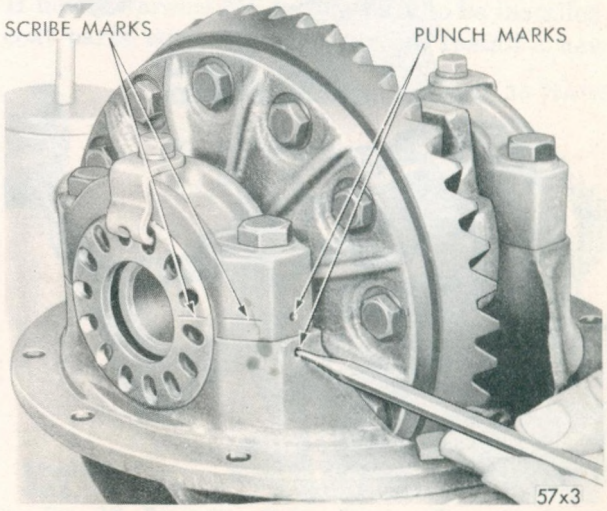


Fig. 10—Marking Caps and Adjusters

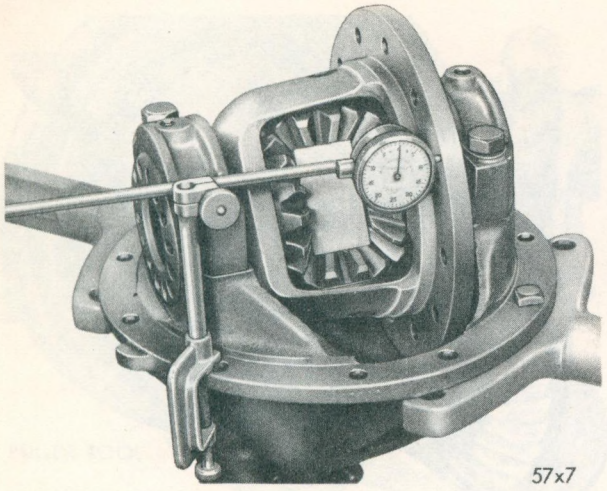


Fig. 11—Checking Drive Gear Mounting Flange

runout, as shown in Figure 11. Runout should not exceed .003 inch.

Inspect bolt holes in drive gear mounting flange for wear or out of round. If bolt holes are out of round, the drive gear will creep on the case.

After checking the runout of the assembly, remove the differential case assembly from carrier. Use Tool C-293 in combination with 3

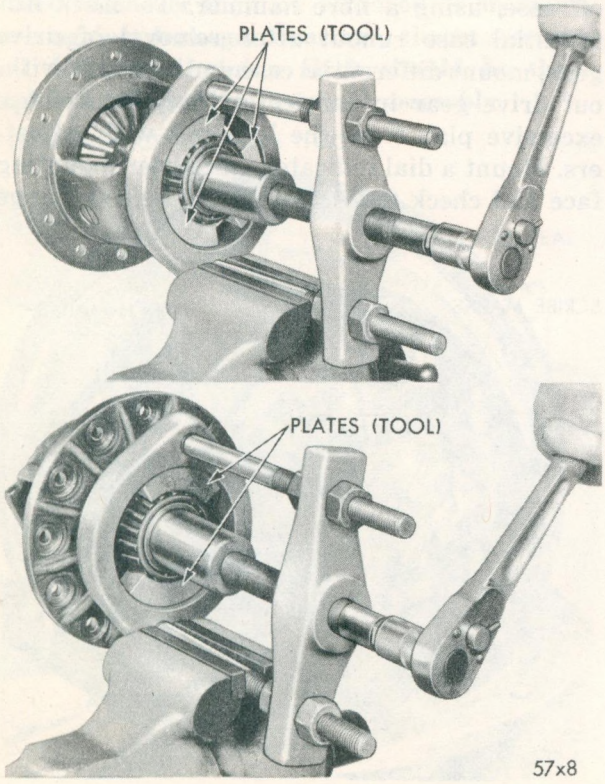


Fig 12—Removing Differential Case Bearings

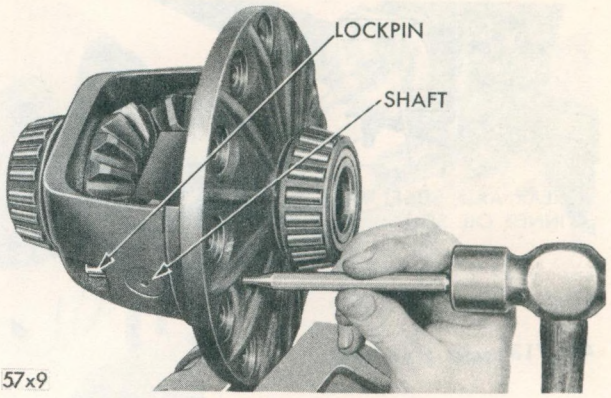


Fig. 13—Removing Differential Pinion Shaft Lock Pins

Number 18 adapter plates behind bearings to pull off the differential bearings from case, as shown in Figure 12.

Remove differential pinion shaft lock pins by driving pin from case with a hammer and punch, as shown in Figure 13. Drive the long differential pinion shaft out of differential case, using a brass drift and hammer. This shaft can be identified as having only one retaining pin. Rotate one differential side gear until each pinion appears at the large opening of case. Remove each pinion and thrust washer one at a time, as shown in Figure 14. Lift out rear axle drive shaft thrust block.

5. DISASSEMBLY OF DRIVE PINION SHAFT AND BEARING ASSEMBLY

Remove the companion flange retaining nut and Belleville washer (Fig. 15) and with puller Tool C-452, and flange holding Tool C-784, re-

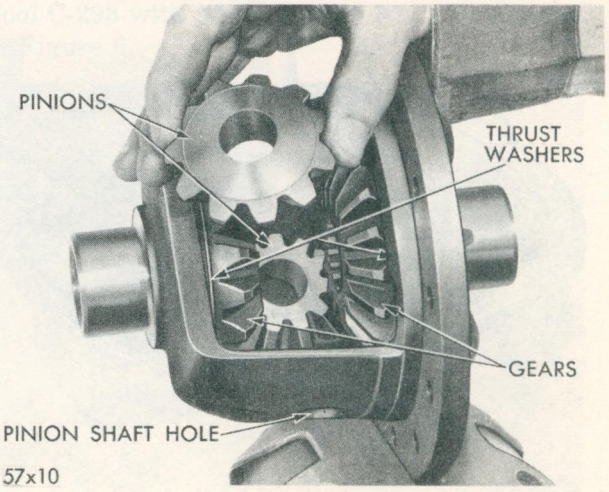


Fig. 14—Removing or Installing Pinion Gear

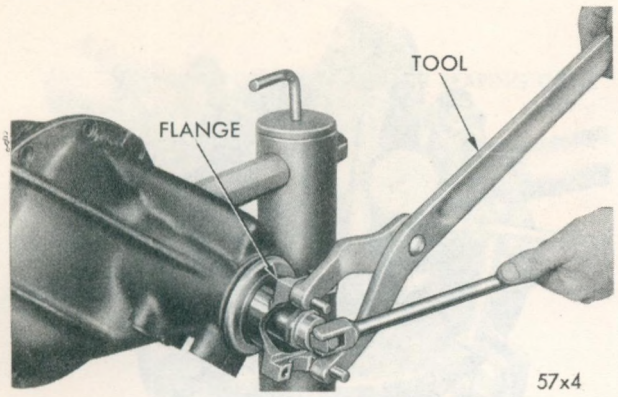


Fig. 15—Removing Companion Flange Nut

move the companion flange, as shown in Figure 16. Insert pinion oil seal puller Tool C-748 into seal and remove seal from housing, as shown in Figure 17. Remove pinion bearing washer, bearing cone, and pre-load shims, or spacer (if so equipped). Remove differential carrier. If necessary, remove the rear bearing from pinion shaft, with puller Tool C-293, and four adapter plates, as shown in Figure 18. Slide the pinion adjusting washer off shaft. If necessary, remove both bearing cups from carrier housing, using a suitable drift. Place drift alternately in the two machined slots, in order to drive cups out evenly. Clean carrier, pinion shaft and related parts in suitable solvent, inspect and replace parts as necessary.

6. CLEANING AND INSPECTION

Clean all parts thoroughly in a suitable solvent and blow dry with compressed air. Remove any chips or foreign material from carrier housing. Inspect all machined surfaces for nicks, burrs or scratches including inner and outer thrust shoulders of differential case. The thrust shoulder on adjusters must be free from burrs so that bearing cups will seat properly. Check differential case for cracks, fractures, distortion or damage. Install a new case if necessary. The bearings should be immersed in clean solvent and rotated by hand until clean. After cleaning, blow dry with compressed air. **Do not spin the bearings with air pressure when blowing them dry, as they are likely to score due to absence of any lubrication.** Check bearings for roughness, or brinelling. The bearings must run free and show no indication of roughness or wear. Examine bearing cups for pitting, scoring or wear. Inspect all gears for chipped or worn gear teeth. Check the fit of differential side gears on axle shaft splines and differential gears on pinion shaft. Check thrust washers for wear, and replace if necessary. Inspect axle shafts splines for wear, cracks or distortion. Replace necessary parts.

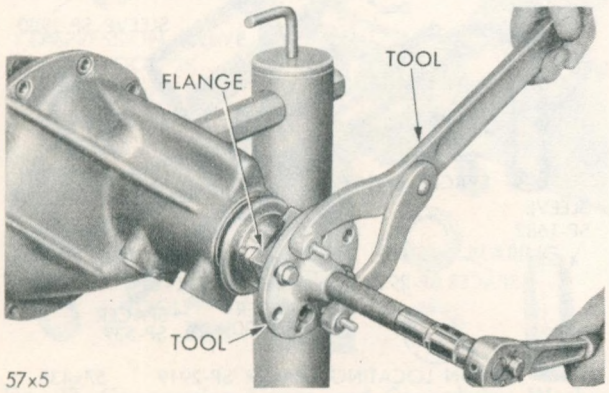


Fig. 16—Removing Companion Flange

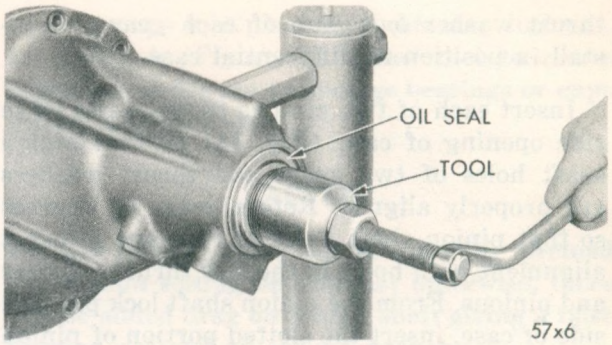


Fig. 17—Removing Drive Pinion Bearing Oil Seal

7. ASSEMBLING THE DIFFERENTIAL CASE AND PINION GEARS

If new differential side gears are to be installed, coat parts with Hypoid Gear oil. Install a new

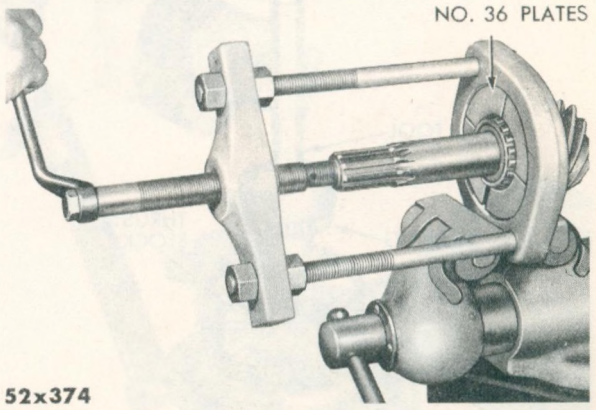


Fig. 18—Removing Pinion Bearing From Shaft (Puller C-293-F2)

thrust washer over hub of each gear and install in position in differential case.

Insert each of two pinions through the large side opening of case (Fig. 18) so that pinion shaft holes of two gears and thrust washers are properly aligned. Rotate gears 90 degrees so that pinion shaft holes of case are in exact alignment with holes in the two thrust washers and pinions. From the pinion shaft lock pin hole side of case, insert the slotted portion of pinion shaft through case; the conical thrust washer just through one pinion gear. Install the thrust block between two pinion gears.

IMPORTANT

The thrust block must be installed so that hole in block is aligned with pinion shaft and with the ground sides facing the two side gears.

While keeping all of these parts in proper alignment, push the pinion shaft on through until locking pin hole in pinion shaft is in exact alignment with its respective hole in case.

NOTE: Before installing pinion shaft lock pin, rotate the differential gears. They must turn freely throughout the 360 degree revolution. The clearance between each gear and case ranges from .001 to .008 inch. This clearance has been established to ascertain free rotation.

Install pinion shaft lock pin through hole in case from the pinion shaft side of the drive gear flange. Position each differential bearing

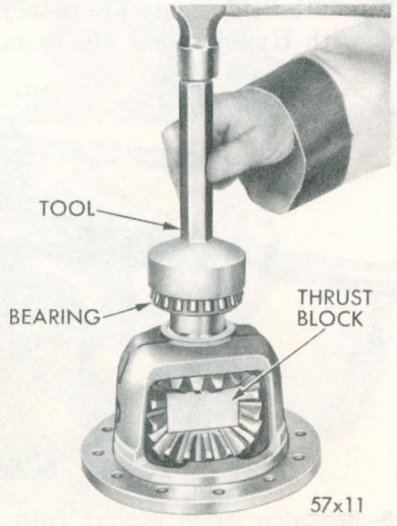


Fig. 19—Installing Differential Bearings

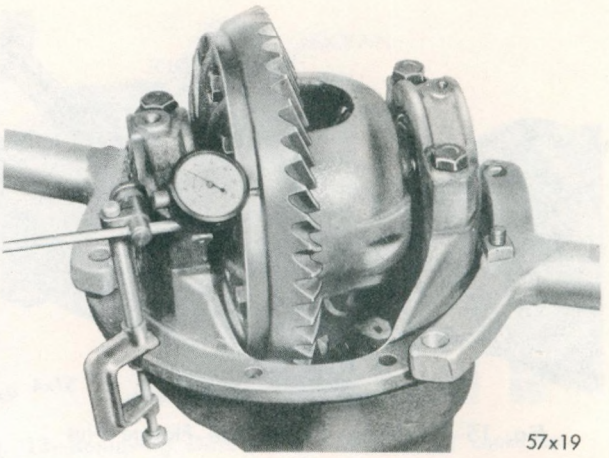


Fig. 20—Checking Drive Gear Runout

cone on hub of case (Fig. 19) (taper away from drive gear) and with installing Tool DD-1005, install bearing cones. Make certain that contacting surfaces of drive gear and flange are clean and free from burrs. Position drive gear on case aligning the threaded holes of drive gear with those in the case flange. Insert drive gear cap screws through case flange and into drive gear. After it has been ascertained that all cap screws are properly started into their respective threads, tap gear onto case with a fiber mallet until it seats properly on case flange. Position drive gear between brass jaws of vise and alternately tighten each cap screw to 55 foot-pounds torque.

Place differential bearing cups over bearings, and install complete assembly in carrier housing. Seat the adjusting nuts in the cap pedestals of carrier housing, and install caps and bolts. **Be sure caps are on the same side from which**

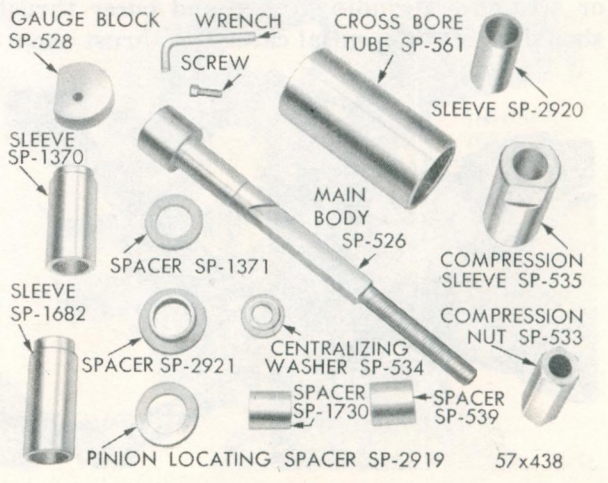


Fig. 21—Special Tool Set C-758-D-3

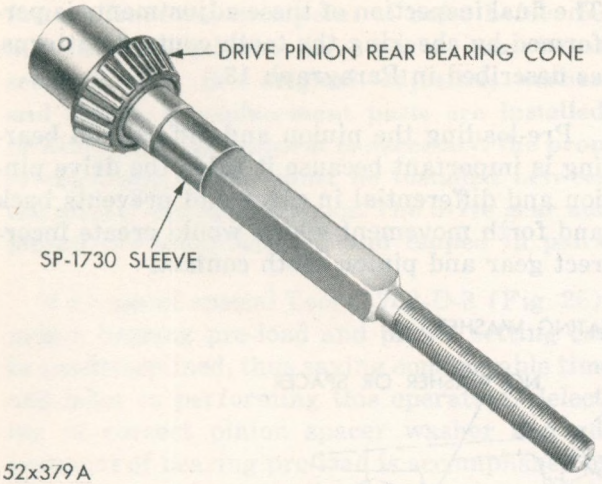


Fig. 22—Bearing Installed on Main Body of Tool C-758-D-3

they were removed. Adjust and remove excessive play from bearings. Check drive gear for runout, as shown in Figure 20.

NOTE: If there is more .005 inch runout the differential case should be replaced.

8. INSTALLATION OF DRIVE PINION SHAFT, BEARING CONES AND CUPS

Place bearing cups in position in carrier, refer to Tool-set C-758-D-3 (Fig. 21) and proceed as follows: With bearing cups squarely in position in carrier, assemble Tool C-758-D-3 by placing rear pinion bearing over main screw of tool (Fig. 22) and insert tool into carrier from gear side. Place the front pinion bearing over main screw, followed by adaptor SP-535, washer SP-534 and nut SP-533 (Fig. 23). Press bearing cups into place by tightening tool nut, as shown in Figure 24. **Allow tool to rotate slightly in order not to damage bearings or cups during this operation.**

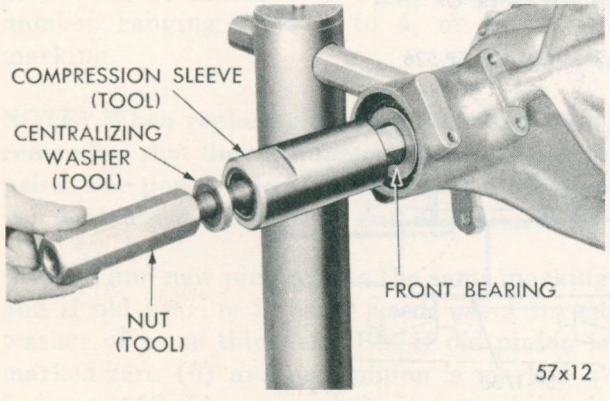


Fig. 23—Compression Sleeve and Centralizing Washer Positioned in Carrier

CAUTION

Do not install pinion oil seal during preload and pinion setting operations; otherwise, there will be added drag on pinion shaft giving a false bearing preload on torque wrench.

Pinion Bearing Pre-load Adjustment

The importance of correct pinion bearing pre-load cannot be over-emphasized. The selection of adjusting washers to give the desired pre-load should be carefully made. When pinion bearings are installed without pre-loading, the cones are not drawn far enough into their cups to bring the rollers in full contact with thrust ribs on cones. Bearings installed in this manner would allow pinion to "walk" backward and forward under operating loads. This causes a variation in tooth contact pattern, resulting in excessive wear and scoring of gears, and usually is accompanied by noise. On the other hand, where the pinion bearing cones are drawn too far into their cups, the bearings are over-loaded even before they have to withstand operating loads imposed upon them by gears. They are apt to "burn up" under a driving load—the rollers might score the cups, causing bearings to gall or flake, resulting in premature axle failure.

Correct cone distance is obtained by use of a spacer and washer combination. **Do not install pinion oil seal during pre-load and pinion**

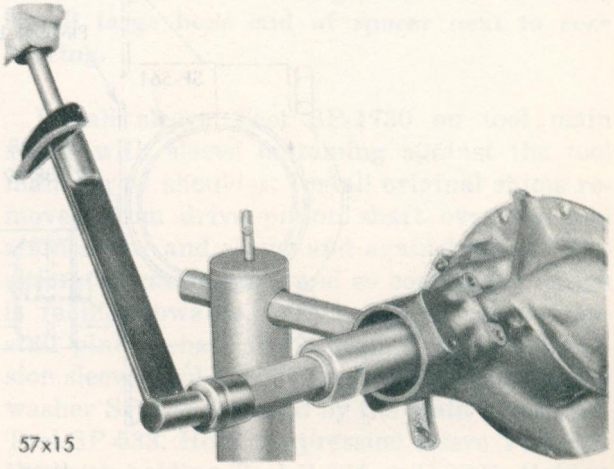


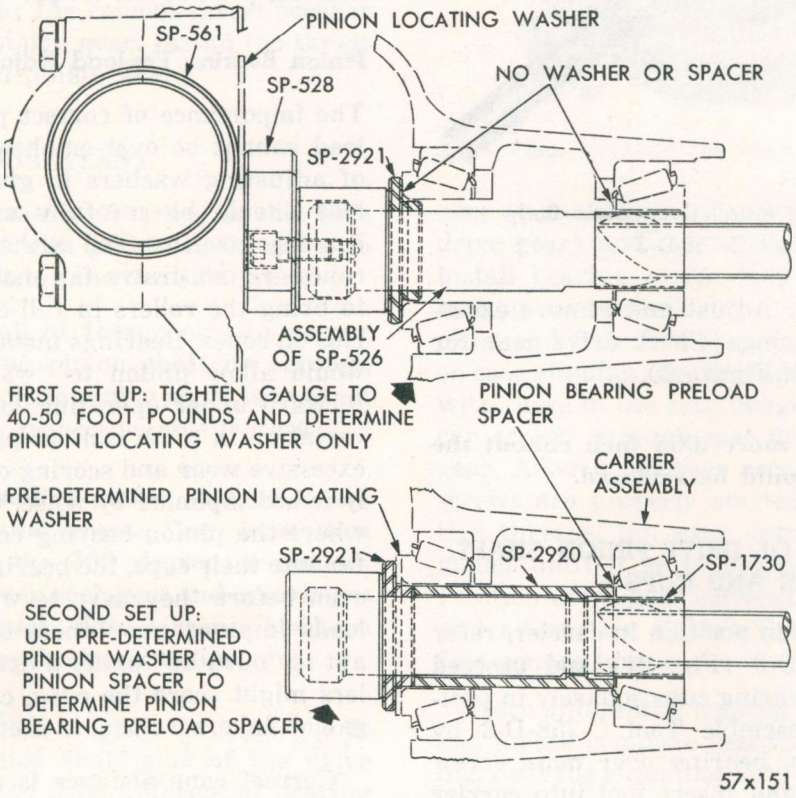
Fig. 24—Seating Bearing Cups and Checking Torque

setting operations, otherwise, there will be an added drag on pinion shaft which would give a false bearing pre-load on the torque wrench.

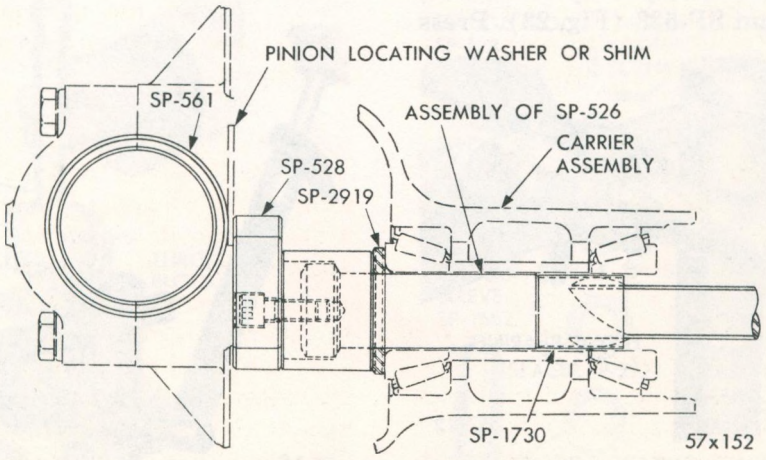
9. PINION BEARING PRE-LOAD AND PINION SETTING (Without using special Tool C-758-D-3)

Correct drive gear and pinion adjustment consists of following: Pinion Bearing Pre-load, Pinion Setting, Differential Bearing Pre-load, and Backlash between Drive Gear and Pinion. The final inspection of these adjustments is performed by checking the tooth contact patterns, as described in Paragraph 13.

Pre-loading the pinion and differential bearing is important because it holds the drive pinion and differential in place and prevents back and forth movement which would create incorrect gear and pinion tooth contact.



Used on New Yorker-Imperial



Used on Windsor

Fig. 25—Tool C-758-D-3 Installed in Housing

NOTE: If the differential assembly was satisfactory from the standpoint of noise before being disassembled, the drive pinion may be assembled with the original adjusting washers and shims. If replacement parts are installed, or differential adjustment is necessary, the proper thickness washer must be installed between the pinion and rear bearing. The drive gear and pinion are manufactured and lapped in pairs.

With use of special Tool C-758-D-3 (Fig. 25), pinion bearing pre-load and pinion setting can be predetermined, thus saving considerable time and labor in performing this operation. Selecting of correct pinion spacer washer and adjustment of bearing pre-load is accomplished by adjusting washers available in various thicknesses, and selected to give pre-load within specified limits. Pinion bearing adjusting washers are available in fifteen different sizes as follows:

Spacer Thickness

.175 in.	.191 in.
.177 in.	.193 in.
.179 in.	.195 in.
.181 in.	.197 in.
.183 in.	.199 in.
.185 in.	.201 in.
.187 in.	.203 in.
.189 in.	

To obtain proper pinion setting in relation to drive gear, the correct thickness thrust washer must be selected before drive pinion is installed in carrier. To select proper thickness thrust washer, proceed as follows: It will be noted that face of drive pinion is etched with plus (+), or minus (—) sign, followed by a number ranging from 1 to 4, or zero, (0) marking.

NOTE: When replacing a ring gear and pinion, remember that they are matched and lapped in pairs. The position in which the best tooth contact is obtained is etched on end of pinion shaft.

If old and new pinion have the same marking and if old bearing is being used, use a thrust washer of same thickness. But if old pinion is marked zero (0) and new pinion is marked + 2, try a .002 **thinner** washer. If new pinion is marked — 2, try a .002 inch **thicker** washer. A **thinner** or **thicker** thrust washer may be required covering the range from .084 to .100 inch when making final adjustment.

If bearing cups are to be replaced, place the bearing cups in position in carrier assembly drive cups in place with suitable drift. After properly positioning bearing cups in carrier, assemble drive pinion thrust washer (chamfered side down toward gear) on drive pinion shaft. Install rear bearing, spacer (if so equipped) and shims on pinion shaft. Insert shaft into carrier housing. Install front pinion bearing and universal joint flange washer and nut. **Do not install oil seal.** Tighten rear axle drive pinion flange nut to 240 foot-pounds torque. Rotate drive pinion shaft after tightening flange nut with wrench to properly seat the bearing rollers in bearing cups. Pre-load torque required to rotate pinion shaft with bearings oiled should be 25 to 35 inch-pounds torque. Add shims to **decrease** torque or remove shims to **increase** torque. After correct pinion setting and bearing preload has been obtained, remove drive pinion flange, install oil seal and tighten drive pinion flange washer and nut to proper torque. Install drive gear with grease marking compound and adjust for correct tooth contact and backlash.

10. PINION BEARING PRE-LOAD AND PINION SETTING (C-75 and Town and Country Wagon)

Lubricate pinion bearing cones. Install locating washer SP-2919 on tool mainshaft. Position rear pinion bearing cone on main screw of Tool C-758-D-3 followed by pinion bearing spacer.

NOTE: Spacer has a larger bore at one end, install large bore end of spacer next to rear bearing.

Install sleeve Tool SP-1730 on tool main screw with sleeve bottoming against the tool main screw shoulder. Install original shims removed from drive pinion shaft over the tool main screw and sleeve and against spacer. Position the carrier in stand so companion flange is facing upwards. Insert tool in carrier. Install pinion shaft front bearing and compression sleeve Tool SP-535. Install tool centralizing washer SP-534 followed by the main screw nut, Tool SP-533. Hold compression sleeve Tool SP-535 with holding Tool C-784 or C-3281, tighten nut to 240 foot-pounds torque. (Fig. 26).

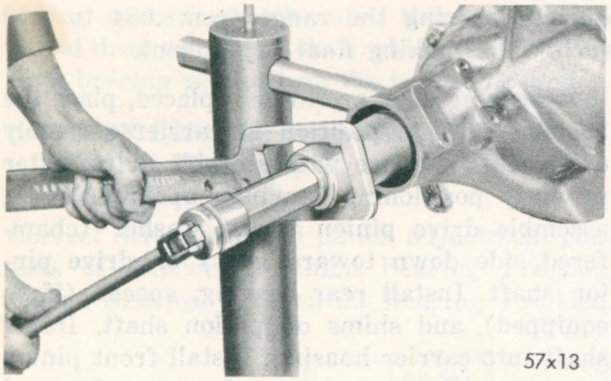


Fig. 26—Tightening Compression Nut

With an inch-pound torque wrench on the nut of tool, rotate wrench several revolutions to seat bearings, (Fig. 24). The correct reading should be 20 to 30 inch-pounds. If bearing pre-load is more than 30 inch-pounds, a thicker shim should be used under front bearings. Shims are available in thickness of .010, .012, .014, .016 and .018 inch. If bearing pre-load is less than 20 inch pounds, a thinner shim should be used.

NOTE: Correct pre-load readings can only be obtained with pinion shaft tool in a vertical position.

Assemble gauge block SP-528 (Fig. 27) to main screw. Place SP-561 bearing arbor in differential carrier bearing supports, as shown in Figure 28.

NOTE: Remove any burrs or upsets in bearing supports before installing bearing arbor, as arbor must be securely seated in bottom of bearing bores.

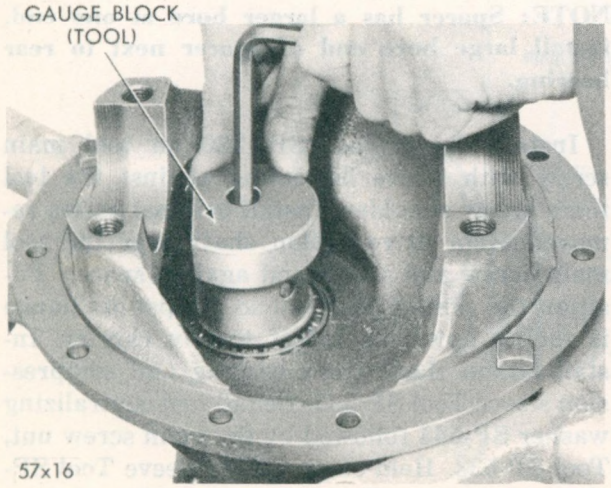


Fig. 27—Installing Gauge Block on Main Body

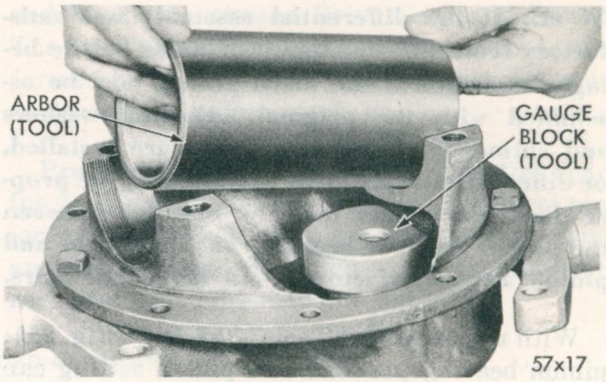


Fig. 28—Installing Arbor

Center arbor in differential bearing pedestals of carrier. Insert a piece of .002 inch shim stock between arbor and each cap and tighten caps to 10 foot-pounds torque. Select a pinion washer of sufficient thickness so that it will just pass between gauge block end of setting tool and machined surface of arbor, as shown in Figure 29.

For example, if a .090 inch washer can be inserted, but a .092 washer cannot be forced between the two surfaces by hand, the .090 inch washer should be used even though it might feel loose. Check end of drive pinion as it should indicate amount that should be added or subtracted from washer that was selected in above check.

Example: If mark on pinion shaft indicated + 2, a .002 inch thinner washer should be used for final assembly. If spacer selected by the use of tool is .090 inch, it is necessary to deduct .002 inch. The correct washer, therefore, for final assembly would be .088 inch.

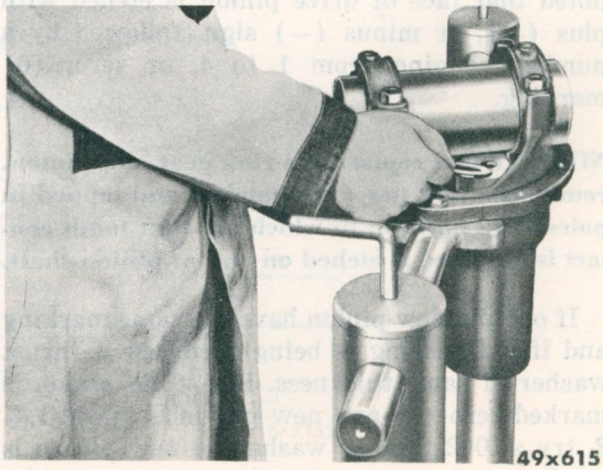


Fig. 29—Determining Spacer Washer Thickness

When correct washer has been selected for drive pinion, disassemble tool from differential carrier housing. Add washer selected to tool, between spacer SP-2921 and pinion rear bearing. Add spacer SP-2920 and the **pinion bearing adjusting spacer** (that was removed from the axle at disassembly). Insert tool assembly in carrier housing. Slide front bearing on shaft and into position in its cup. Install tool spacer, nut and washer. Tighten tool 240 minimum foot-pounds torque, as shown in Figure 24. Turn the tool with a speed wrench to permit bearings to seat. When bearings are seated, check bearing pre-load by revolving tool, using an inch-pound torque wrench, as shown in Figure 27. The correct bearing pre-load should be 25 to 35 inch-pounds torque.

If the bearing adjustment does not conform to above specifications, it will be necessary to change the adjustment by using a thicker or thinner bearing spacer. A **thicker** spacer should be used if pre-load is too great or a **thinner** spacer if pre-load is not sufficient. When correct spacer has been selected for drive pinion bearings, remove the differential bearing cap, shim stock and arbor from carrier housing. Disassemble tool from differential carrier housing. Install pinion setting washer over pinion shaft with chamfered side against the pinion. Make certain the contacting surfaces of rear bearing cone are perfectly clean. Install cone and shaft and press bearing on shaft with Tool DD-955. (Fig. 30).

Install the selected shim pack. Lubricate front and rear pinion bearing cone with heavy

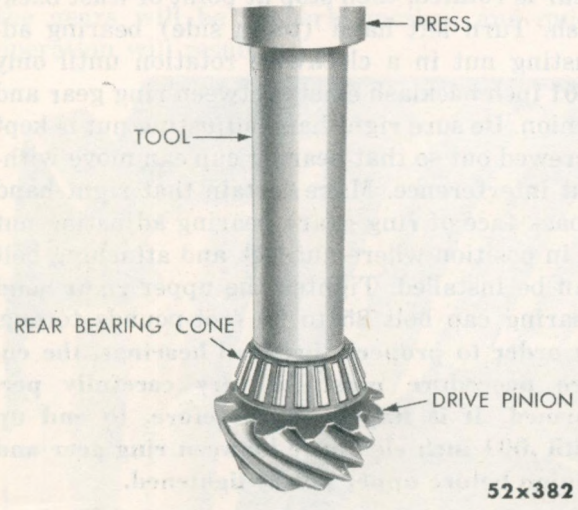


Fig. 30—Installing Pinion Bearing Cone on Pinion Shaft

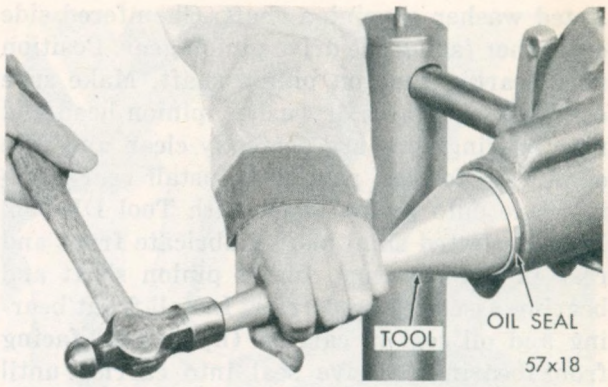


Fig. 31—Installing Drive Pinion Oil Seal

oil. Insert new oil seal with driver Tool C-359 making sure it is seated all the way in carrier (Fig. 31). Install companion flange on pinion shaft with Tool C-496. Holding companion flange with Tool C-784, tighten nut to 240 foot-pounds torque.

11. PINION BEARING PRE-LOAD AND PINION SETTING (C-76 and Imperial Models)

Check the bearing cups and carrier for grit and dirt. Assemble washer SP-2921 followed by correct pinion locating washer and spacer SP-2920 along with rear bearing on main shaft of Tool C-758-D-3. Insert tool, bearing and washer assembly in carrier along with original shims previously removed from drive pinion shaft. Install front bearing, compression sleeve SP-535, centralizing washer SP-534 and main nut SP-533. Hold compression sleeve nut with holding Tool C-784 or C-3281 and torque nut to 240 foot-pounds.

With an inch-pound torque wrench, rotate wrench in a clockwise direction several revolutions to seat bearings. The correct torque reading should be from 25 to 35 inch-pounds. If bearing preload is more than 35 inch-pounds, a thicker shim should be used under front bearing cone. Shims are available in thicknesses of .010, .0125, .015, .016, and .018 inch. If bearing preload is less than 25 inch-pounds, a thinner shim should be used.

NOTE: Correct pre-load can only be obtained with tool in a vertical position.

Remove tool with shim pack, bearing cone, pinion locating washer, and spacer from carrier.

Assembly of Pinion in Carrier

With shaft end of pinion facing up, install se-

lected washer on pinion shaft. Chamfered side of washer facing the drive pinion gear. Position rear bearing cone on pinion shaft. Make sure contacting surfaces of washer, pinion head and rear bearing cone are perfectly clean and free of dirt or foreign particles. Install rear bearing cone onto pinion shaft with Tool DD-955. Install selected shim pack. Lubricate front and rear pinion bearings. Insert pinion shaft and bearing assembly on carrier. Install front bearing and oil seal in carrier (lip of seal facing front bearing). Drive seal into carrier until seal is seated against shoulder of the carrier. Support pinion gear in carrier and start companion flange with installing Tool C-496 or DD-999. Install plain washer (concave side of washer down) and nut. Torque flange nut 240 foot-pounds and remove tool.

12. SETTING DIFFERENTIAL BEARING PRE-LOAD AND BACKLASH

Differential bearing pre-load and backlash between drive gear and pinion are obtained after pinion bearing pre-load and pinion settings, as described in Paragraph 10. Place differential bearing cups over bearings and install complete assembly in carrier housing. Seat adjusters in pedestals of carrier housing and install caps and bolts.

NOTE: Make sure caps are assembled to carrier in same position from which they were removed.

Make certain that differential bearings and

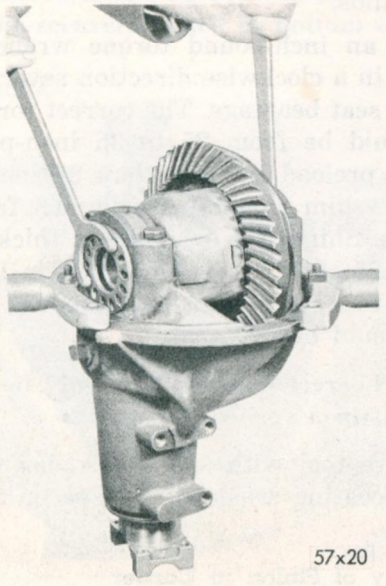


Fig. 32—Adjusting Differential Bearings Adjusters

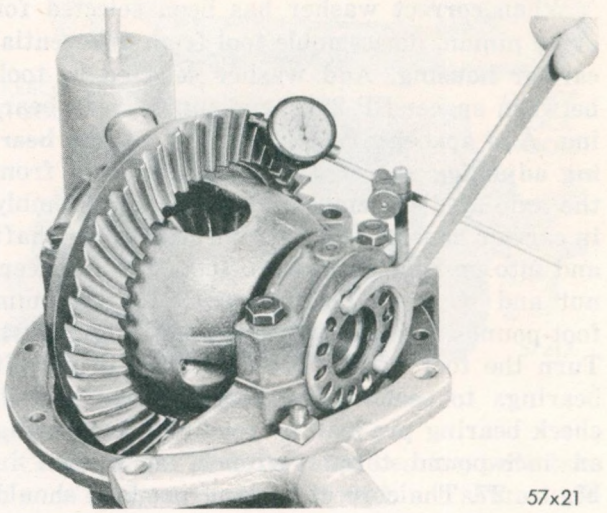


Fig. 33—Checking Backlash Between Drive Gear and Pinion

cups are properly seated, as follows: Using spanner wrench Tool C-406, as shown in Figure 32, turn right hand bearing adjusting nut in clockwise rotation until considerable backlash exists between ring gear and pinion. Back off adjusting nut several turns. Tighten lower pedestal bolts 85 to 90 foot-pounds torque, leaving top bolts slightly loose as this holds bearing cups in line while moving ring gear. Mount dial indicator on differential housing so that plunger rests against one of the ring gear teeth, as shown in Figure 33. (Make certain that indicator is properly positioned so that plunger will accurately indicate that exact amount of backlash.) Check backlash between ring gear and pinion at 90 degrees intervals as the ring gear is rotated, then stop at point of least backlash. Turn left hand (tooth side) bearing adjusting nut in a clockwise rotation until only .001 inch backlash exists between ring gear and pinion. Be sure right hand adjusting nut is kept screwed out so that bearing cup can move without interference. Make certain that right hand (back face of ring gear) bearing adjusting nut is in position where nut lock and attaching bolt can be installed. Tighten the upper **right hand** bearing cap bolt 85 to 90 foot-pounds torque. **In order to properly pre-load bearings, the entire procedure must be very carefully performed. It is important therefore, to end up with .001 inch clearance between ring gear and pinion before upper bolt is tightened.**

Turn left hand adjusting nut in a clockwise direction until dial indicator shows a backlash

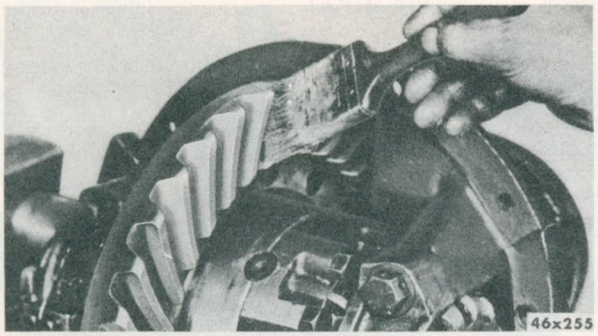


Fig. 34—Applying Red Lead to Indicate Tooth Contact

of .006 inch between ring gear and pinion, as shown in Figure 33. Considerable effort will be required to turn adjusting nut to last notch or two. This is necessary, however, to insure adequate pre-load. The adjustment should be performed so that adjuster lock and attaching bolt can be installed. Tighten right hand bearing cap attaching bolt 90 foot-pounds torque, and recheck the other three. After final tightening of all pedestals, bolts, recheck backlash. As a result of this method of adjustment, the carrier pedestals have been spread, the differential bearings have been pre-loaded, and backlash between ring gear and pinion has been correctly set.

CAUTION

Whenever adjustment of differenial assembly is changed to obtain correct tooth contact, readjust differential bearing pre-load and backlash between ring and pinion.

If all adjustments have been correctly made, the gears will be properly meshed and quiet operation will result.

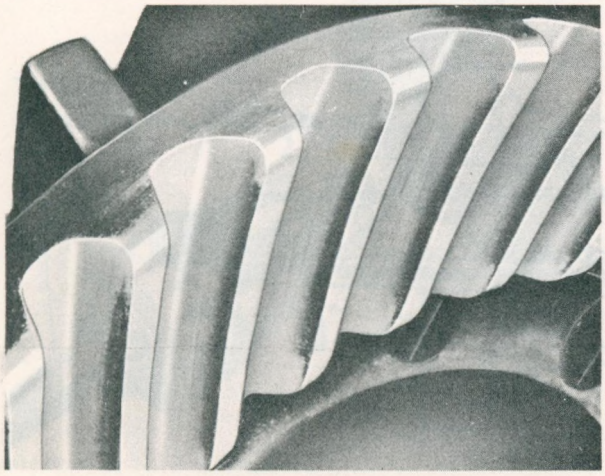


Fig. 35—Heavy Face Contact

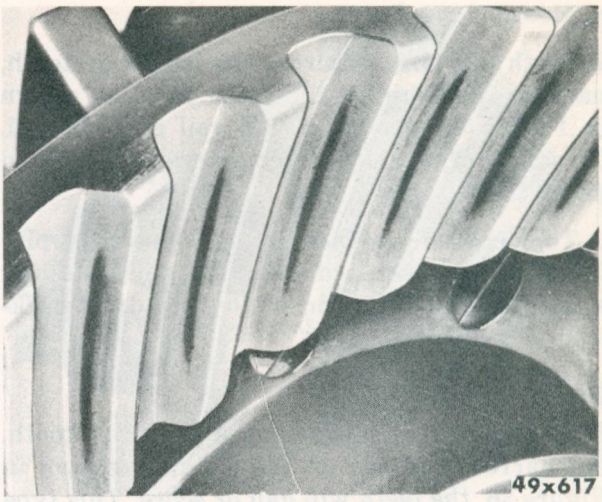


Fig. 36—Heavy Flank Contact

13. GEAR ADJUSTMENT FOR CORRECT TOOTH CONTACT

Check tooth contact by means of gear marking compound applied to drive gear teeth, as shown in Figure 34. Apply load against back face of drive gear with a round bar as drive pinion is rotated. This leaves a bare area the size, shape and location of contact. If improper tooth contact is evident, as indicated by Fig. 35 and 36, the pinion should be adjusted either forward or backward, maintaining the backlash within specified limits until correct tooth contact, as shown in Figure 37, is obtained. With adjustments properly made, correct tooth contact, as shown in Figure 37, will result. Notice that contact pattern is well centered on the drive and coast sides about $\frac{1}{16}$ inch from edges of teeth. When tooth marks are obtained by hand, they are apt to be rather small. Under an actual operating load, however, the contact area increases. Figures 35 and 36 show improper or incorrect tooth contact. To correct such conditions, readjust drive gear and pinion as follows:

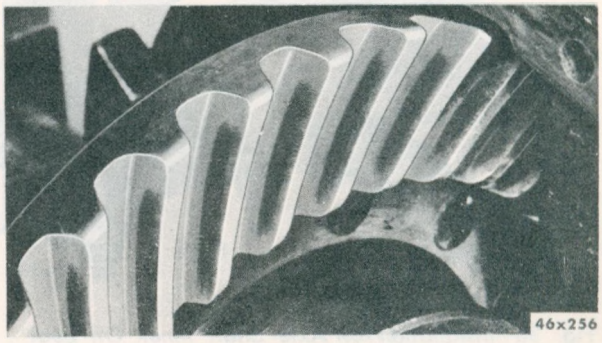


Fig. 37—Correct Gear Tooth Contact

a. Heavy Face Contact

If tooth marking is across the length of tooth, narrow and high on the tooth face, as shown in Figure 36, the teeth will roll over or gall. This type of contact causes excessive wear and noise.

To correct heavy face contact—move the pinion in **toward center** of drive gear by installing a **thicker** washer behind pinion. Readjust backlash.

b. Heavy Flank Contact

If tooth marking is across the length of tooth, but narrow and low on the flank, as shown in Figure 36, the teeth will gall or score. This type of contact causes excessive wear and noise.

To correct heavy flank contact—move the pinion **away from the center** of the drive gear by using a **thinner** washer behind pinion. Readjust backlash.

14. INSTALLATION OF AXLE ASSEMBLY

Check carrier housing flange and flange face on differential housing for nicks and burrs. Mount differential carrier to axle housing using a new gasket. Tighten mounting nuts 35 foot-pounds torque. Reinstall rear axle shaft, brake supports and check axle end play, as outlined in Paragraph 16. Connect brake tubes, bleed brakes, install rear wheels, and tighten rear axle shaft nuts to a minimum of 145 foot-pounds torque. Install new cotter pin. Reinstall propeller shaft and fill rear axle differential with correct viscosity Hypoid Oil. Refer to Lubrication, Section XV of this manual.

15. INSTALLATION OF AXLE SHAFTS

NOTE: New oil seals should be installed whenever seals are removed from axle housing and brake support plate.

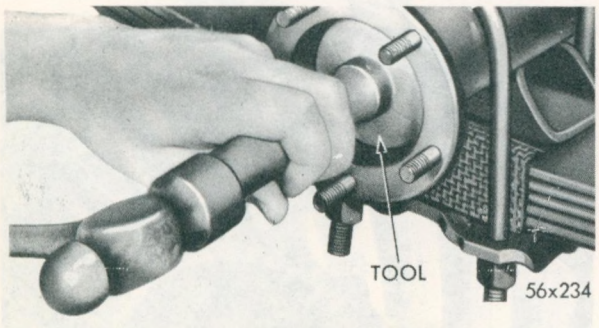


Fig. 38—Installation of Axle Shaft Inner Oil Seal with Tool C-839

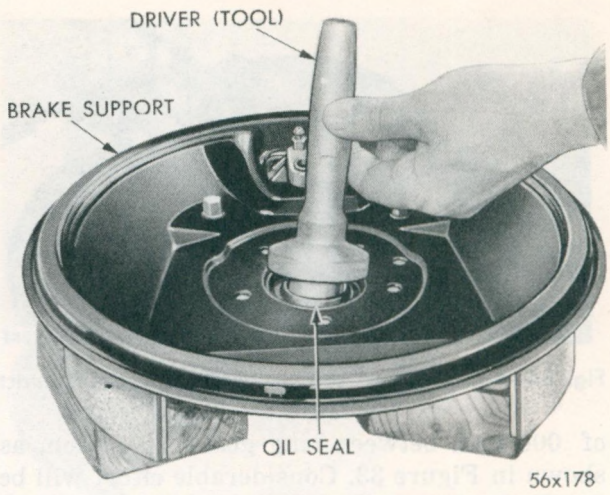


Fig. 39—Removing or Installing Outer Oil Seal with Tool C-839

Install rear axle drive shaft inner oil seal in housing, using special drift Tool C-839, as shown in Figure 38. Install outer oil seal in brake support plate, as shown in Figure 39. Leather seals should be prepared for installation by soaking them in light engine oil for 30 minutes. Before installing axle shaft in housing, examine bearing surface of bearing cups for wear and pits, also surface of axle shaft on which the oil seal wiped to make sure the machined surface is smooth and free from tool marks and burrs. If necessary, dress down surface of shaft with a stone or fine emery cloth to make sure a smooth bearing surface is maintained for oil seal.

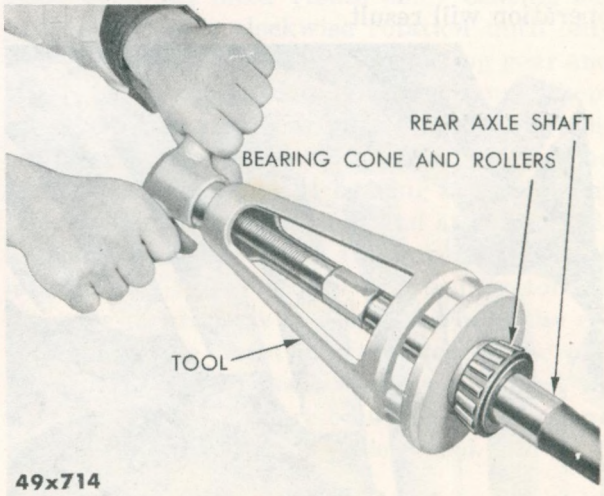


Fig. 40—Installing Axle Shaft Bearing

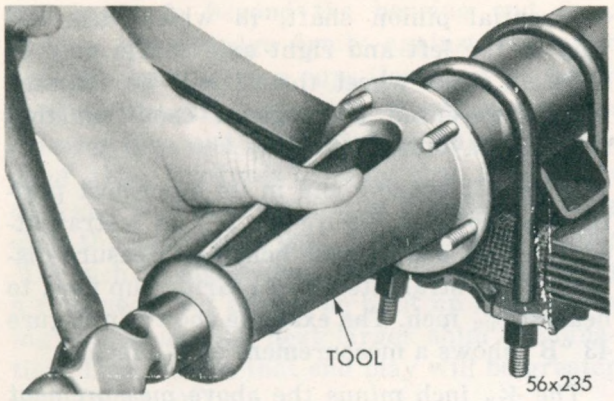


Fig. 41—Installing Axle Drive Shaft Bearing Cup with Tool C-413

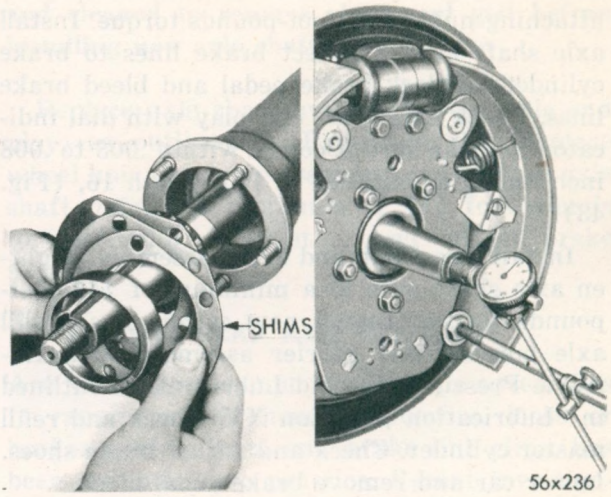


Fig. 42—Checking Axle Shaft End Play

NOTE: Stone or emery polish lines should run around and not along shaft.

To install axle shaft, replace bearing on axle shaft with special Tool C-158 (Fig. 40) and moderately lubricate axle bearings with multi purpose grease. Carefully insert axle shaft in housing, making sure shaft and differential side gear splines align. Install axle drive shaft outer bearing cup wth special driver Tool C-413, as shown in Figure 41. Install axle shaft shims in same manner as removed to maintain central position of axle shaft thrust block. Install special sleeve Tool C-757 in axle bearing outer oil seal, before mounting brake support to axle housing (Fig. 4), to protect seal from being damaged by axle housing flange and brake support. Install brake support plates and tighten

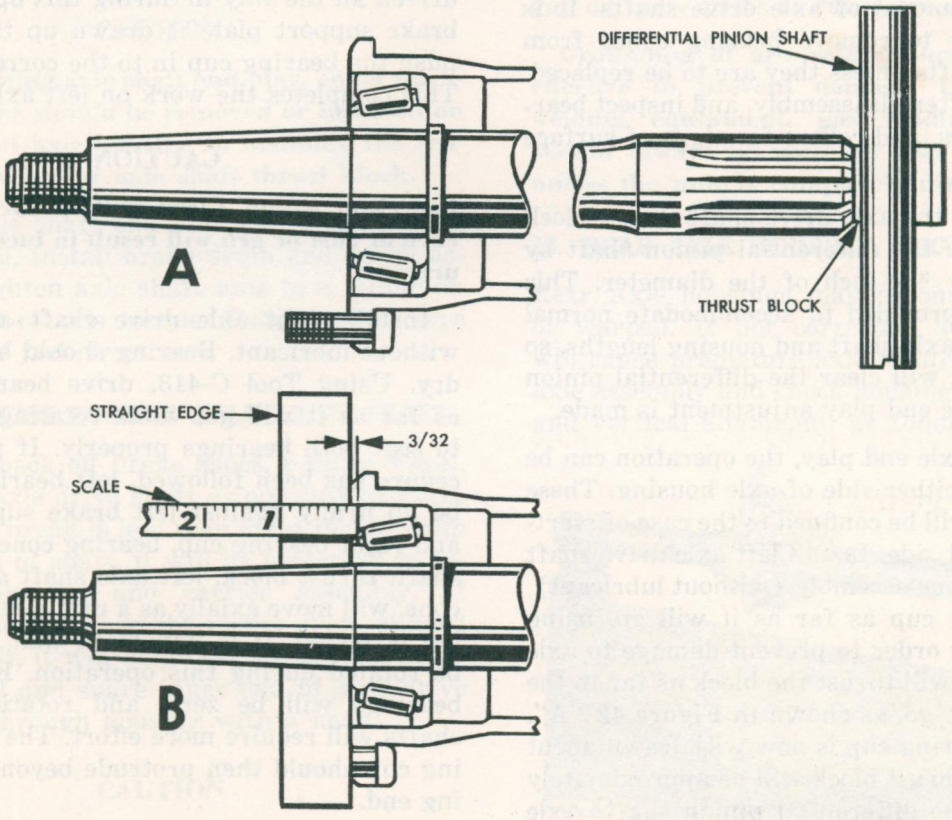


Fig. 43—Adjusting Axle Shaft End Play

attaching nuts to 35 foot-pounds torque. Install axle shaft keys. Connect brake lines to brake cylinder, unblock brake pedal and bleed brake lines. Check axle shaft end play with dial indicator to make sure it comes within .003 to .008 inch limits, as outlined in Paragraph 16, (Fig. 43).

Install wheel hub and drum assembly. Tighten axle shaft nuts to a minimum of 145 foot-pounds torque. Install new cotter pins. Refill axle housing and carrier assembly with Extreme Pressures Hypoid Lubricant, as outlined in "Lubrication", Section XV. Check and refill master cylinder. Check and adjust brake shoes. Lower car and remove brake pedal block.

16. SETTING AXLE SHAFT END PLAY

Rear axle shaft end play is adjusted by use of adjusting shims that are bolted between the axle housing ends and brake support plates. The shims are available in thicknesses of .005, .010, .0125, .015, and .030 inch. The correct axle end play is .013 to .018 inch. One or more shims may be required to obtain correct end play.

Preparation for setting axle shaft end play consists of removal of axle drive shafts. It is not necessary to remove bearing cones from axle drive shafts unless they are to be replaced. Clean parts after disassembly, and inspect bearing cups, cones, and rollers for signs of surface failure.

The hole in the axle drive shaft thrust block is longer than the differential pinion shaft by approximately $\frac{3}{16}$ inch of the diameter. This difference is provided to accommodate normal tolerances on axle shaft and housing lengths, so that the block will clear the differential pinion shaft after the end play adjustment is made.

To adjust axle end play, the operation can be started from either side of axle housing. These instructions will be confined to the case of starting at the left side. Install left axle drive shaft and bearing cone assembly (without lubricant). Drive bearing cup as far as it will go, using Tool C-413, in order to prevent damage to axle housing. This will thrust the block as far to the right as it can go, as shown in Figure 43 "A". If the left bearing cup is now withdrawn about $\frac{3}{32}$ inch, the thrust block will be approximately centered on the differential pinion shaft. Axle operation is not affected by mislocation of the thrust block unless the block bears against the differential pinion shaft, in which case end play of the left and right axle shafts may be different, and wheel thrust will be imposed upon differential bearings, a condition that should be avoided.

With left bearing cup in its innermost position, as shown in Figure 43 "A", lay a straightedge across end of axle housing. Measure distance from straightedge to bearing cup face, to nearest $\frac{1}{64}$ inch. The example shown in Figure 43 "B" shows a measurement of $\frac{1}{16}$ inch.

The $\frac{3}{32}$ inch minus the above measurement gives thickness of shims at left end of housing to center the thrust block. For the above example, a shim $\frac{1}{32}$ inch thick would center the thrust block. A .030 inch shim is close to the thickness required for the example, however, it is good practice to use about .010 less, shim thickness for the centering adjustment than the exact amount required for centering. For this example, .020 inch shim would be used.

Remove left axle shaft, grease bearing, reinstall shaft and bearing. Using correct thickness of shims or shim, install the left brake support plate. The bearing cup should not be driven all the way in during this operation. As brake support plate is drawn up tight, it will push the bearing cup in to the correct position. This completes the work on left axle.

CAUTION

Use clean shims. Clean mating surfaces. Presence of rust or grit will result in incorrect measurement.

Install right axle drive shaft and bearing without lubricant. Bearing should be clean and dry. Using Tool C-413, drive bearing cup in as far as it will go, while rotating axle shaft to seat both bearings properly. If proper procedure has been followed, left bearing cup will be up firmly against left brake support plate, and right bearing cup, bearing cone, right axle shaft, thrust block, left axle shaft and bearing cone, will move axially as a unit, until left bearing is seated. It is important that axle shafts be rotated during this operation. End play in bearings will be zero, and rotation of axle shafts will require more effort. The right bearing cup should then protrude beyond the housing end.

The use of .010 less centering shim at the left end helps assure that the right bearing cup

will protrude beyond the housing end face. Hold a straightedge firmly against the outer face of right bearing cup. Using set of feeler gauges, measure accurately distance between housing face and straightedge. This measurement gives thickness of shim that would give zero end play if it were used in assembly. The shim thickness to be used is obtained by adding .013 inch to above measurement. If this gives a thickness that cannot be built up from existing shims, use the next larger shim combination. This insures that end play will be greater than .013 inch.

For example of end play setting, assume right bearing cup face protrudes .028 inch beyond end face of housing. Shim thickness required for .013 inch end play is .028 + .013 inch equals .041 inch. This cannot be obtained with existing shims, so .0425 inch is used, which is obtained with one .030 inch and one .0125 inch shim. The end play is then .0425 inch minus .028 inch, equals .0145 inch.

Remove right axle shaft and lubricate bearing. Install axle shaft, bearing and shim and complete the assembly.

CAUTION

When adjusting axle shaft end play, equal thickness of shims should be removed or installed on both sides of axle housing to maintain the centralized position of axle shaft thrust block.

After axle shaft end play has been checked or corrected, install brake drum and wheel assembly. Tighten axle shaft nuts to a minimum of 145 foot-pounds torque. Install cotter keys and remove jack from car.

17. REMOVING BROKEN AXLE DRIVE SHAFT

Raise car, back off brake shoes, remove wheel, drum and axle drive shaft as outlined in Paragraph 3. If break is less than eight inches from splined end of shaft, it will be necessary to remove differential and carrier assembly. If break is more than eight inches from splined end of shaft, it will be necessary to remove inner oil seal and snare inner end of axle drive shaft out through housing with a hoop.

CAUTION

To avoid damage to rear axle carrier assembly, oil must be drained from differential housing and cleaned to remove chips and grit before installing new axle shaft.

Replace axle shaft and check rear axle end play, as outlined in Paragraph 15. Replace wheel hub and drum assembly and tighten axle shaft nuts to a minimum of 145 foot-pounds torque. Refill differential, and adjust brake shoes.

18. WELDING REAR AXLE HOUSING

Arc welding of complete rear axle assemblies to repair leaking housings, covers, loose or broken spring seats and brake line clips, has been common shop practice. Recent investigations, however, have proven that arc welding should definitely **NOT** be used for repairing the rear axle housing, unless axle is completely disassembled. It is possible for arcing electric current to jump the gap and damage roller bearings when there is end play. The damage is similar to brinelled bearing marks. It is further possible for damage to be done to the faces of the drive gear and pinion, as well as differential side gears and pinions, if conditions are just right for the existence of sufficient backlash gap on these parts to cause arcing.

Grounding of arc welding equipment is not effective to prevent damage. Instead of arc welding equipment, gas welding equipment should always be used on rear axle housing, unless the unit is completely disassembled.

19. REAR AXLE HOUSING ALIGNMENT

Rear Axle housings may become bent, bowed or warped. If not corrected, such conditions will cause premature axle failure. Disassemble axle assembly and check housing for horizontal and vertical alignment, as follows:

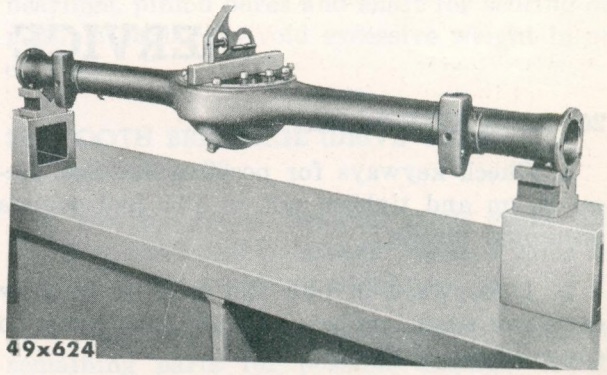


Fig. 44—Leveling Housing for Checking Alignment

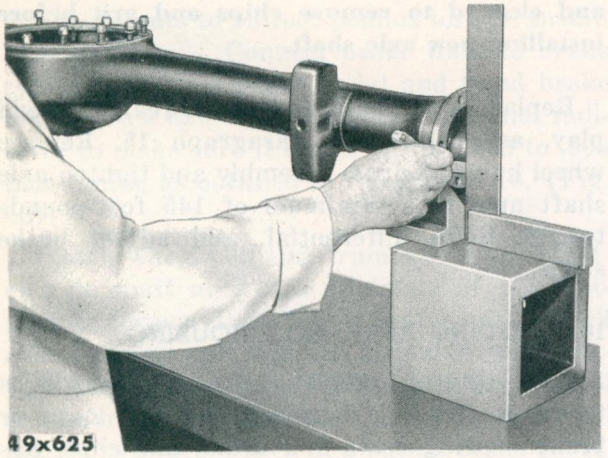


Fig. 45—Checking Horizontal Alignment

a. Checking Axle Housing for Horizontal Alignment

Place axle housing in "V" blocks—on surface plate. Turn housing until machined surface for carrier mounting is facing UP and perfectly level, as shown in Figure 44. Place square against machined surface of housing end flange and surface plate, as shown in Figure 45. Amount of housing misalignment will be indicated by thickness of feeler gauge between square and end flange at top or bottom. A housing that checks more than .007 inch should be replaced.

b. Checking Axle Housing for Vertical Alignment

With housing in "V" blocks, turn housing until machined surface for carrier mounting is in a squared, vertical position, as shown in Figure 46. Place a square against machined surface of housing end flange and surface plate, as shown in Figure 47. Amount of housing misalignment

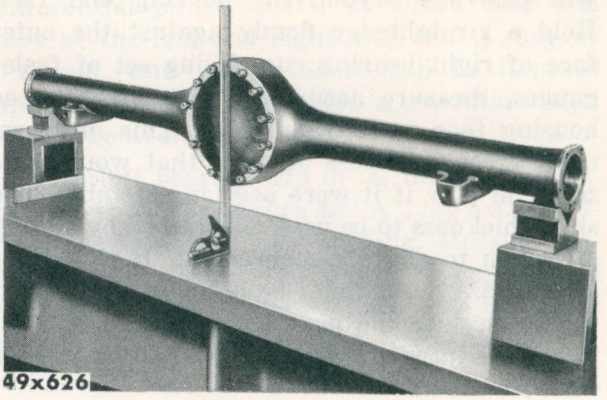


Fig. 46—Squaring Axle for Vertical Alignment

will be indicated by thickness of feeler gauge between square and end flange at top or bottom. A housing that checks more than .007 inch should be replaced. To determine amount that axle is misaligned, multiply thickness of feeler stock used by the ratio of 4.7 to 1.

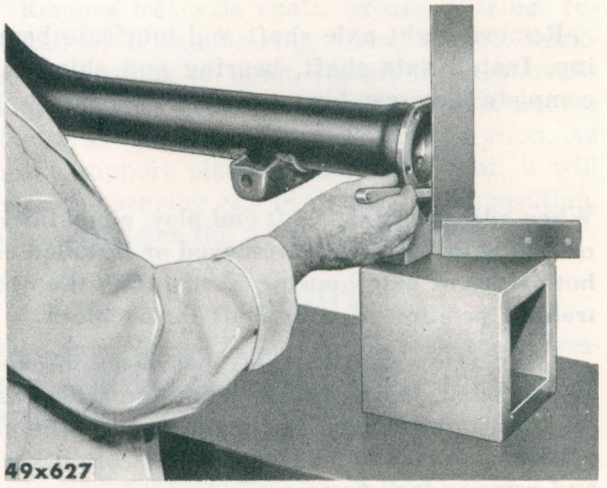


Fig. 47—Checking Vertical Alignment

SERVICE DIAGNOSIS

20. REAR AXLE NOISE

a. Check keyways for possible damage. Reset drum and tighten nut to 145 foot-pounds minimum torque.

b. If keyways in hub and axle shaft show excessive wear, replace hub and axle shaft to correct this condition.

c. Tighten loose wheel hub bolts.

d. Check bearings for possible damage and replace if necessary. Refer to Lubrication Section, XV for proper lubrication.

e. Check rear wheel bearings. If scored or show signs of wear, they should be replaced.

f. Defective or brinelled bearings must be replaced. Check rear axle shaft end play.

g. Readjust axle shaft end play to bring desired clearance of .003 to .008 inch.

21. NOISE IN REAR AXLE ASSEMBLY

a. Refer to Rear Axle Housing Alignment, Paragraph 19, in this section.

b. Replace bent or sprung axle shaft.

c. Refer to Pinion Bearing Pre-Load, Paragraph 9, in this section.

d. Refer to Backlash Adjustment, Paragraph 12, in this section.

e. Adjust pinion bearings, as outlined in Paragraph 8, a, in this section.

f. Tighten drive pinion flange nut.

g. Check axle shaft end play. Readjust to bring desired end play clearance of .003 to .008 inch.

h. Check lubricant. Replace scuffed gears. For correct tooth contact, refer to Paragraph 12, in this section.

22. REAR AXLE DRIVE SHAFT BREAKAGE

a. Replace broken shaft and readjust end play to desired clearance of .003 to .008 inch.

b. Replace broken shaft, after correcting Rear Axle Housing Alignment, as outlined in Paragraph 19, in this section.

c. Replace broken shaft. Avoid excessive weight in or on car.

d. Replace broken shaft after checking for other possible causes. Avoid erratic use of clutch.

e. Replace broken shaft. Refer to Clutch, Section IV, to correct this condition.

23. DIFFERENTIAL CASE BREAKAGE

a. Replace broken case and examine gears and bearings for possible damage. At reassembly, adjust differential bearings, as outlined in Paragraph 12, in this section.

b. Replace broken case and examine gears and bearings for possible damage. At reassembly, adjust drive gear and pinion backlash to required specification of .006 inch, as outlined in Paragraph 12, in this section.

c. Replace broken case and examine gears and bearings for possible damage. Avoid excessive weight in or on car.

Replace broken case. After checking for other possible causes, examine gears and bearings for possible damage. Avoid erratic use of clutch.

24. DIFFERENTIAL SIDE GEAR BROKEN AT HUB

a. Replace damaged gears. Examine other gears and bearings for possible damage. Check Rear Axle Housing Alignment, as outlined in Paragraph 19, in this section.

b. Replace damaged gears. Check axle shafts for alignment, and examine other gears for possible damage.

c. Replace damaged gears. Examine other gears and bearings for possible damage. Replace thrust washers that are badly worn. Side gear to thrust washer clearance should be from .004 to .012 inch.

25. SCORING OF DIFFERENT GEARS

a. Replace scored gears. Scoring marks on the pressure face of gear teeth, or in the bore are caused by instantaneous fusing of the mating surfaces. **Scored gears should be replaced.** Fill rear axle to required capacity with Extreme Pressure Hypoid Lubricant SAE 90 (winter and summer), or with SAE 80 below —10 degrees F.

b. Replace scored gears. Inspect all gears and bearings for possible damage. Clean out and refill axle with Extreme Pressure Hypoid Lubricant SAE 90 (winter and summer), or with SAE 80 below —10 degrees F.

c. Replace scored gears. Inspect all gears, pinion bores and shaft for scoring or bearings for possible damage.

d. Replace scored gears. Inspect all gears, bearings, pinion bores and shaft for scoring or possible damage. Avoid excessive weight in or on car.

26. TOOTH BREAKAGE (DRIVE GEAR AND PINION)

a. Replace gears. Examine other gears and bearings for possible damage. Replace parts as needed. Avoid excessive weight in car.

b. Replace gears, being careful to examine remaining parts for possible damage. Avoid erratic clutch operation.

c. Replace gears. Examine remaining parts for possible damage. Replace parts as required.

d. Replace gears. Examine other parts for possible damage. Drive gear and pinion backlash should be .006 inch. Refer to Gear Adjustment for Correct Tooth Contact, Paragraph 13, in this section.

27. REAR AXLE NOISE

Rear axle noises are generally divided into three groups:

(1) **Gear Noise on Pull** — If the noise is of a heavy pitch and increases as the car speed is increased, it is an indication of scored teeth due to loss of lubricant, incorrect mesh of teeth or wrong type of lubricant.

(2) **Gear Noise on Coast** — If the noise is heavy and irregular, it is an indication of scored teeth as a result of excessive end play in pinion bearings or by incorrect adjustments.

(3) **Bearing Noise on Pull or Coast** — This indicates bearings are chipped, cracked, scored, badly worn or loose, or the pinion is improperly positioned. Bearings, that are badly worn or broken, will make a gravelly, rough grating sound that may change slightly in volume as speed changes.

a. If an axle is noisy because of insufficient lubricant, it is too late to obtain any benefit by adding lubricant. The gears or bearings, or both, are likely to be damaged. Inspect all parts, replace damaged parts, and check axle and housing assembly for leaks.

b. Check drive gear and pinion tooth contact, as outlined in Gear Adjustment for Correct Tooth Contact, Paragraph 13, in this section.

c. Remove unmatched drive gear and pinion. Replace with a new matched gear and pinion set. Refer to Removal and Inspection of Differential Carrier Assembly, Paragraph 2, in this section.

d. Check teeth on drive gear and pinion for contact, as outlined in Gear Adjustment for Correct Tooth Contact, Paragraph 13, in this section. If necessary, replace with new matched set.

e. Adjust drive pinion bearings, as outlined in Paragraph 12, in this section.

f. Adjust differential bearings, as outlined in Paragraph 12, in this section.

g. Check drive gear for runout.

h. Tighten carrier housing nuts to required torque. Check for oil leaks.

28. LOSS OF LUBRICANT

a. Drain excess lubricant by removing filler plug, allowing lubricant to level at lower edge of filler plug hole.

b. Replace worn oil seals. Prepare new seals before installation.

c. Refer to Welding Rear Axle Housing, Paragraph 18, in this section.

d. Replace worn drive pinion oil seal. Prepare new oil seal before installation.

e. Replace worn or scored companion flange and oil seal. Prepare new oil seal before installation.

29. OVER-HEATING OF UNIT

a. Refill rear axle, allowing lubricant to level at lower edge of filler plug hole.

b. Drain, flush and refill rear axle with Extreme Pressure Hypoid Lubricant SAE 90 (winter or summer), or with SAE 80 below —10 degrees F.

c. Readjust differential bearings to required pre-load.

d. Check gears for excessive wear or scoring. Replace as necessary.

e. Readjust drive gear and pinion backlash from .006 to .008 inch. Check gear for possible scoring.

NOTE

Oil seals may be destroyed by excessive heat. Replace cracked or hardened seals.

Section III
BRAKES

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DATA AND SPECIFICATIONS

CENTER PLANE SERVICE BRAKES

MODELS	C-75, C-76, IM 1, 2 and 4
TYPE	Center Plane (Floating Shoe) Hydraulic
DRUM DIAMETER	12 in.
LINING	
Type	Moulded Asbestos
Attachment	Cyclebond
Width	2½ in.
Thickness	1$^{3}/_{64}$ in.
BRAKE SHOE RETURN SPRING TENSION USING FISH SCALE HOOKED AT TOE OF SHOE	35 to 45 lbs. required to break contact between shoe and push rod
BRAKE PEDAL FREE PLAY	$^{1}/_{32}$ in. to ⅛ in.
WHEEL CYLINDER BORE	
Front—Upper and Lower	1⅛ in.
Rear	1⅛ in.
MASTER CYLINDER BORE	1⅛ in.
PISTON CLEARANCE	.003 in. to .0065 in.

HAND BRAKE

MODELS	C-75, C-76, IM, 1, 2 and 4
TYPE	External Contracting (Std.,3-Spd.Trans.) Internal Expanding (TorqueFlite Trans.)
LOCATION	Propeller shaft at rear of transmission
DRUM DIAMETER	6 inch (Std., 3-Spd. Trans.) 7 inch (TorqueFlite Trans.)
LINING TYPE	Moulded and Compressed Asbestos
Length	13.52 inch (Std., 3-Spd. Trans.) 13.06 inch (TorqueFlite Trans.)
Width	2.in.
Thickness	5/32 in.
Clearance	.015 in. to .020 in.

SPECIAL TOOLS

Tool Number	Tool Name
C-3014	Installing Tool—Hand Brake Adjusting Nut Spanner
C-3015	Installing Tool—Hand Brake Adjusting Nut Cable
C-3080	Hone—Brake Cylinder Surfacing
C-3281	Wrench—Brake Drum Holding
C-3462	Wrench—Brake Shoe Return Spring Remover and Installer
C-3496	Tank—Master Cylinder Refiller Air Pressure
C-452	Puller—Parking Brake Drum
C-650	Hose—Brake Bleeder
C-757	Installing Sleeve—Rear Axle Shaft Oil Seal
C-845	Puller—Wheel

TIGHTENING REFERENCE

	Foot-pounds
Rear Brake Support Plate Screws	35
Front Brake Support Plate Bolt Nuts	35
Wheel Cylinder Screws	20

Section III
BRAKES

Center-Plane brakes introduced (Fig. 1 and 2) on the 1956 models are continued on the 1957 models. The primary virtues of the center-plane brakes are: (a) greater resistance to fade (b) instantaneous power response (c) less fatigue in heavy traffic when repeated acceleration and braking are necessary.

These brakes are of the drum type, with floating brake shoes mounted between plates located on center plane of lining (Figs. 3 and 4). With wheel cylinders mounted in same plane, braking forces are transmitted equally across width of lining. The web of shoe is contoured in depth, so when brakes are applied equal pressures are applied to brake drums along entire length of lining. The shoes are held in position by brake shoe return springs. One end of each spring is hooked in loop of return spring links. The other end engages the brake shoe.

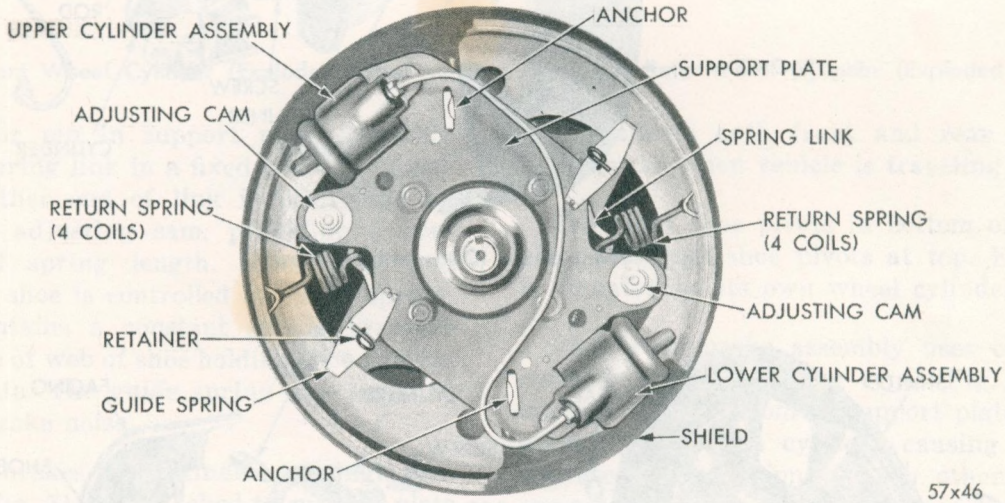

Fig. 1—Center Plane Brake Assembly (Front)

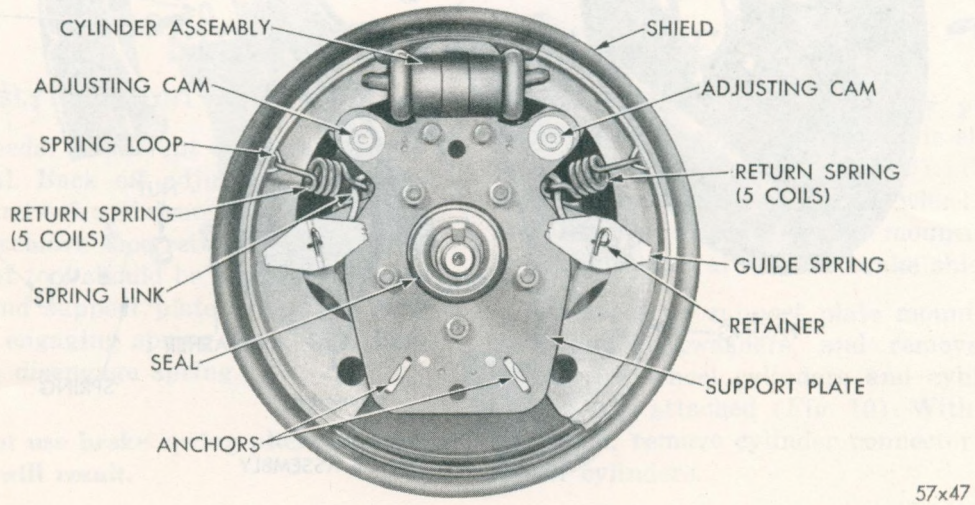

Fig. 2—Center Plane Brake Assembly (Rear)

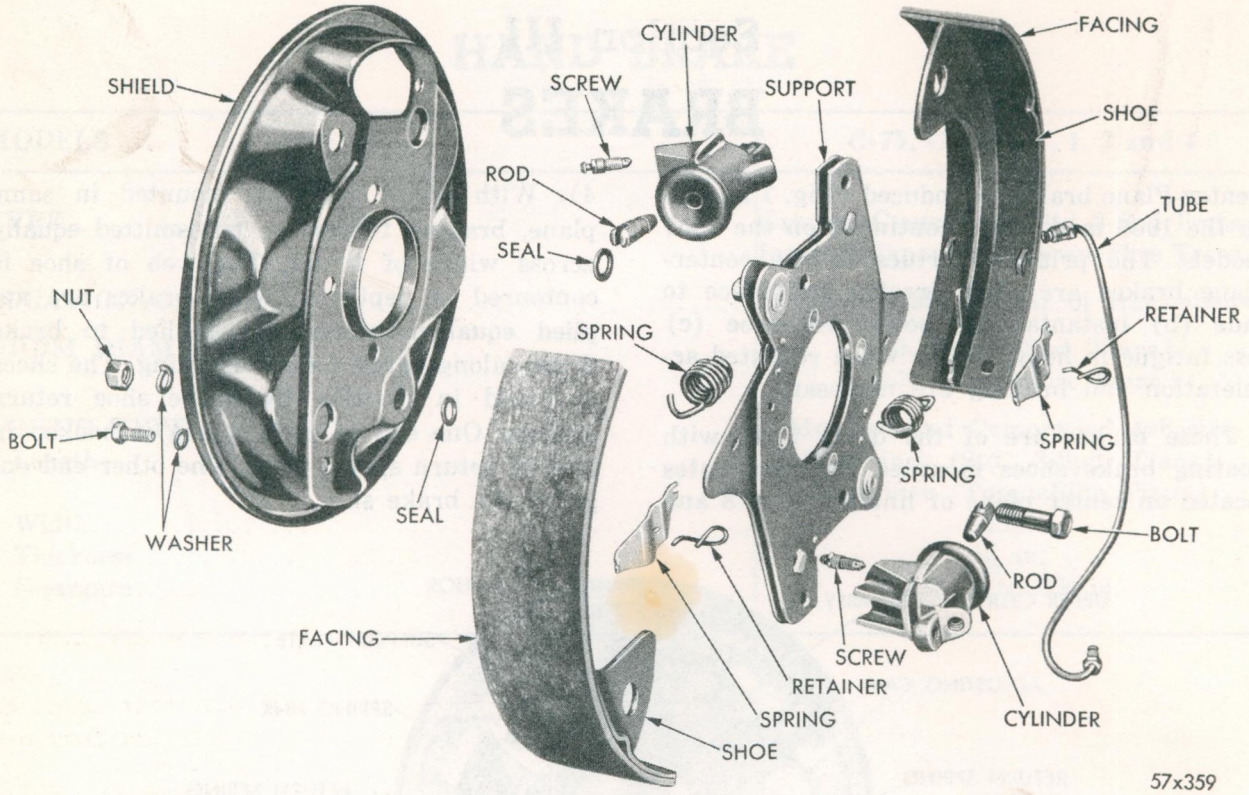

Fig. 3—Front Brake (Disassembled View)

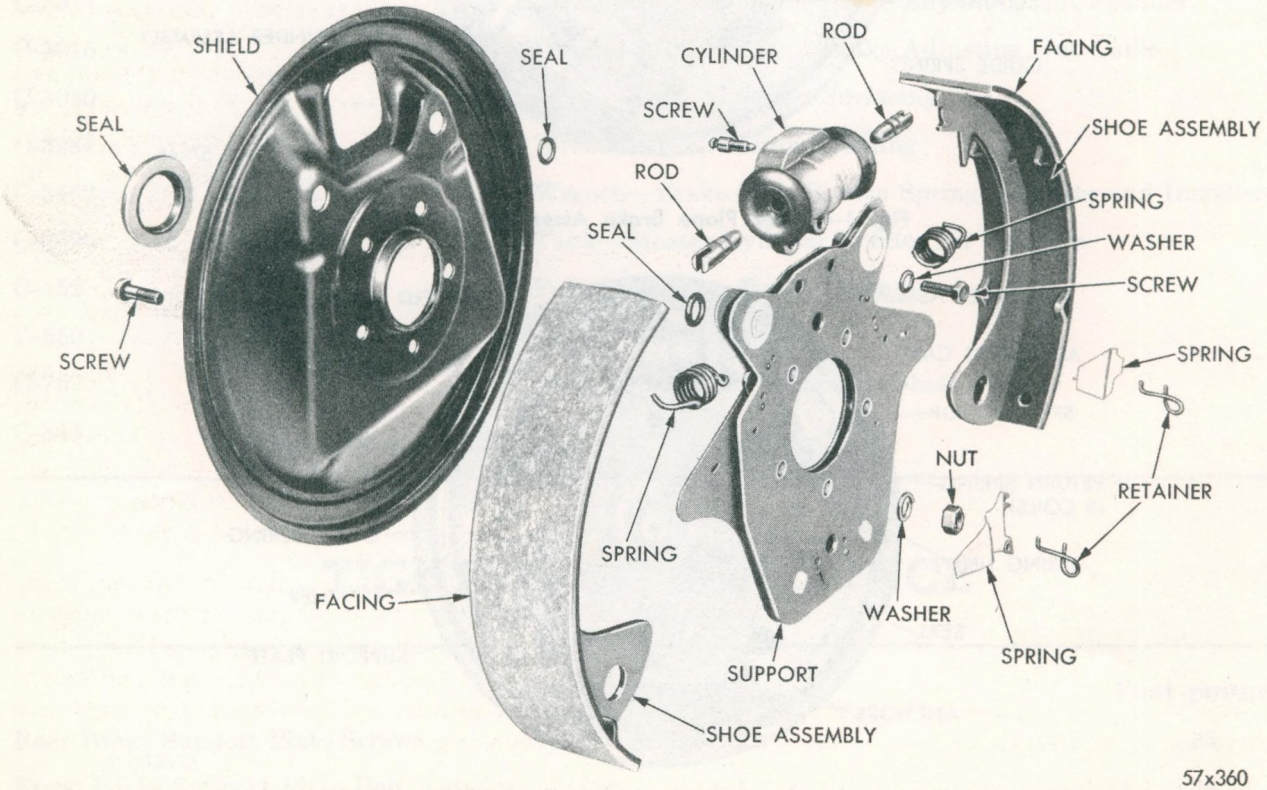

Fig. 4—Rear Brake (Disassembled View)

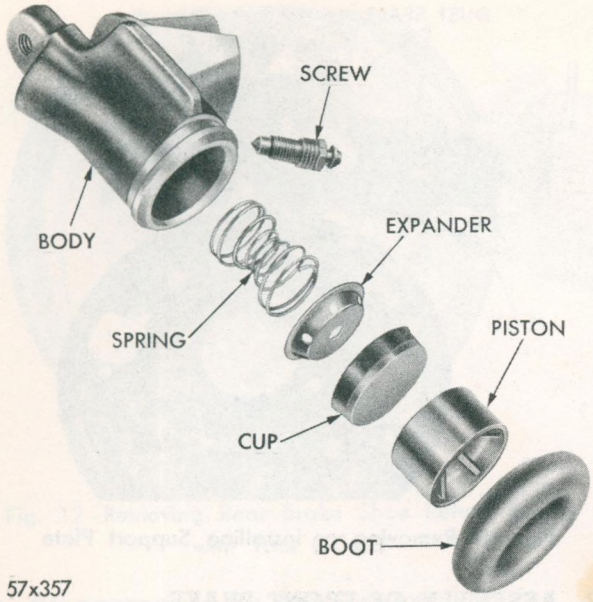

Fig. 5—Front Wheel Cylinder (Exploded View)

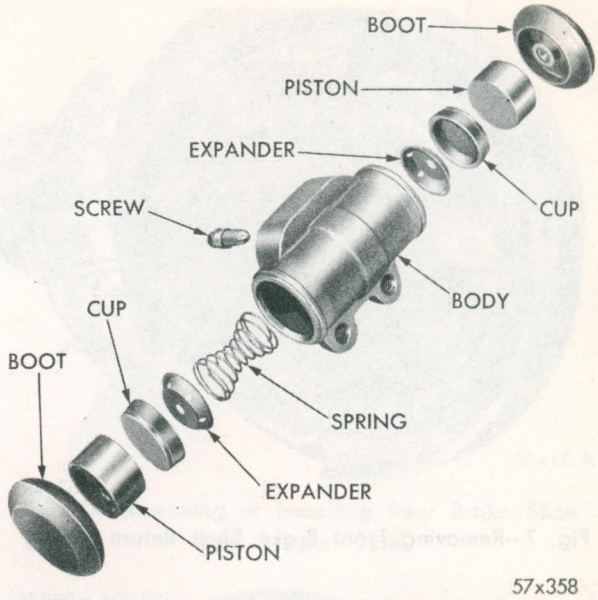

Fig. 6—Rear Wheel Cylinder (Exploded View)

An anchor pin in support plate assembly holds the spring link in a fixed position at one end. The other end of link is positioned by brake shoe adjusting cam, providing a constant-loaded spring length. Side rattle and twisting of shoe is controlled by guide spring, which maintains a constant spring pressure against side of web of shoe holding shoe against support plate. The guide spring also helps to eliminate brake noise.

In front brakes two cylinders of single piston type (Fig. 5) are attached to support plate assembly. The location of cylinders is such that when brakes are applied, self-energizing action affects both front and rear shoes of front brake when vehicle is traveling forward.

The front shoe pivots in bottom of support plate and rear shoe pivots at top. Each shoe is actuated by its own wheel cylinder.

Each rear brake assembly uses one wheel cylinder of double-acting type (Fig. 6). Both shoes pivot in bottom of support plate and are actuated by wheel cylinder causing shoes to operate in opposition to each other. Self-energizing action is effective on rear brake front shoe when vehicle is traveling forward and effective on rear shoe when traveling in reverse.

SERVICE PROCEDURES

1. DISASSEMBLY OF FRONT BRAKE

Block brake pedal to prevent downward movement of pedal. Back off adjusting cams. Remove wheel, and hub and drum assembly. Using Tool C-3462, remove shoe return springs (Fig. 7). The end of tool should be inserted between spring link and support plate assembly. With tool cam slot engaging spring hook, turn handle of tool to disengage spring.

NOTE: Do not use brake spring pliers or damage to lining will result.

Turn brake shoe guide retainer ¼ turn, then remove retainer and guide (Fig. 8). **The lip on end of guide is used for positioning guide on outer support plate.** Slide shoes from between support plates (Fig. 9). Disconnect flexible brake hose at upper wheel cylinder, and remove wheel cylinder mounting screw and lockwasher at rear of brake shield.

Remove four support plate mounting bolts, nuts and lockwashers, and remove support plate with wheel cylinders and cylinder connector tube attached (Fig. 10). With assembly on bench, remove cylinder connector tube and wheel cylinders.

NOTE: Perform operations outlined in "Servicing the Wheel Cylinders".

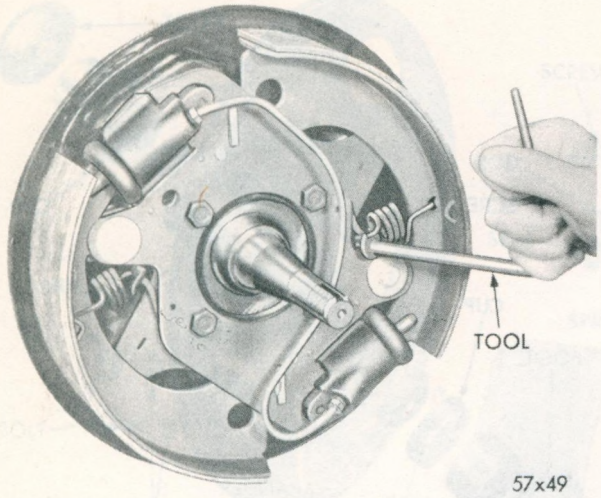

Fig. 7—Removing Front Brake Shoe Return Spring

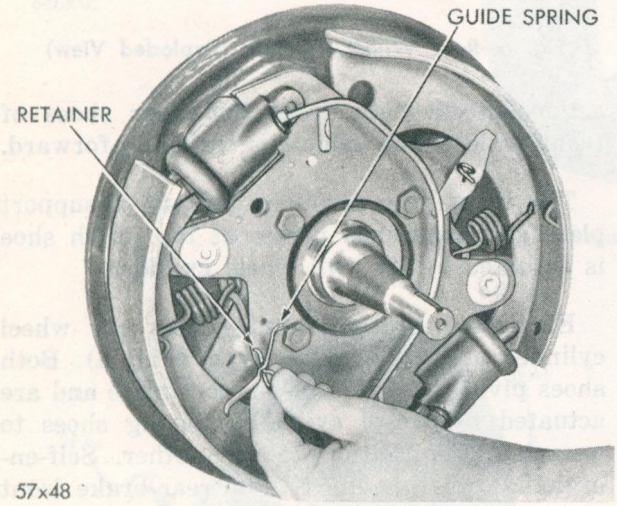

Fig. 8—Front Brake Shoe Guide Spring

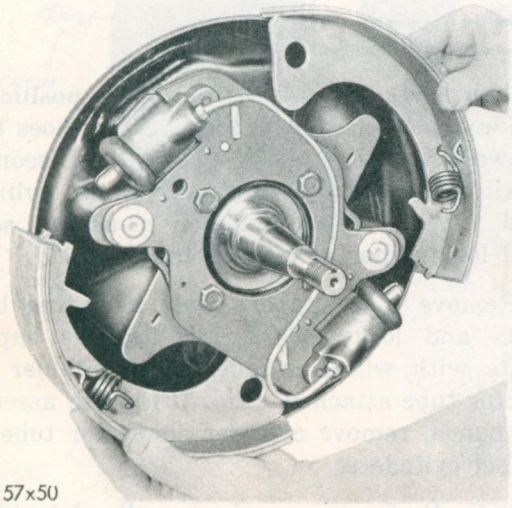

Fig. 9—Removing Front Brake Shoe from Support Plate

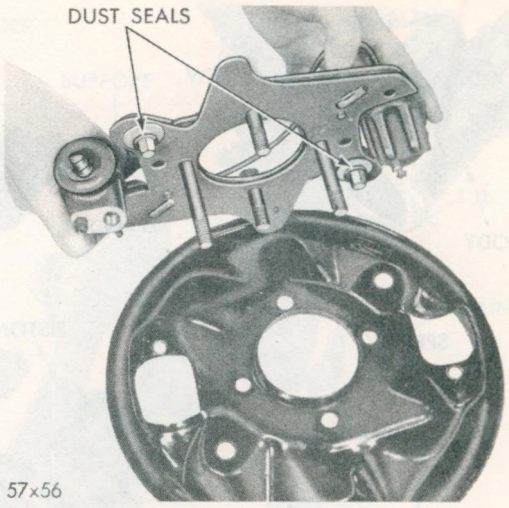

Fig. 10—Removing or Installing Support Plate

2. ASSEMBLY OF FRONT BRAKE

Place wheel cylinders into position in support plate assembly and install connector tube. Position support plate on brake shield and install cylinder mounting screw and lockwasher, but do not tighten.

NOTE: Be sure brake adjusting cam rubber dust washers are in place and in good condition before installing support plate assembly.

Install four support plate bolts, lockwashers, and nuts. Tighten 35 foot-pounds and wheel cylinder mounting screw 20 foot-pounds torque.

Install wheel cylinder flexible brake hose, and tighten all connections securely. Install brake shoes, and brake shoe return springs, (Fig. 11).

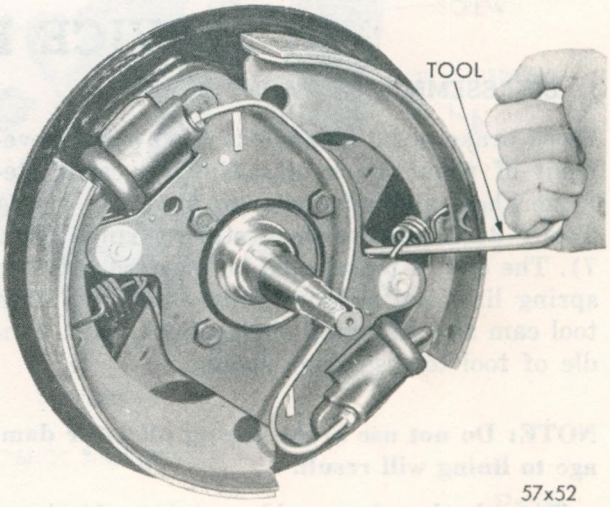

Fig. 11—Installing Front Brake Shoe Return Spring

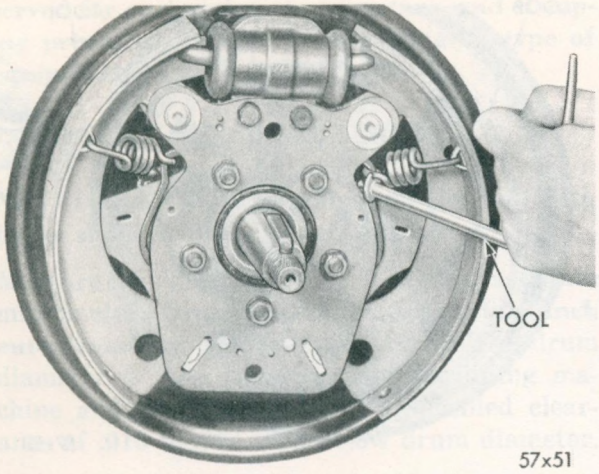

Fig. 12—Removing Rear Brake Shoe Return Spring with Tool C-3462

3. DISASSEMBLY OF REAR BRAKE

Block brake pedal in "UP" (released) position. Raise car and remove wheels. Back off all adjusting cams. Remove hub and drum assembly, using puller Tool C-845. Insert wrench, Tool C-3462, in inner support plate hole, with tool cam slot engaging spring hook (Fig. 12). Turn tool handle to disengage spring from return spring link, and turn handle in opposite direction to release spring. Remove both springs in this manner. **Do not use brake spring pliers or damage to lining will result.**

Turn brake shoe guide spring retainer ¼ turn and remove guide spring, (Fig. 13). The lip on end of spring is for correct positioning on outer support plate. Remove brake shoes

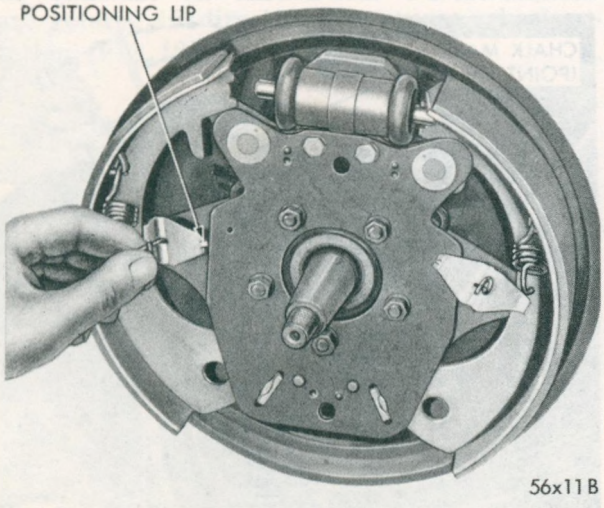

Fig. 13—Removing or Installing Rear Brake Shoe Guide Spring

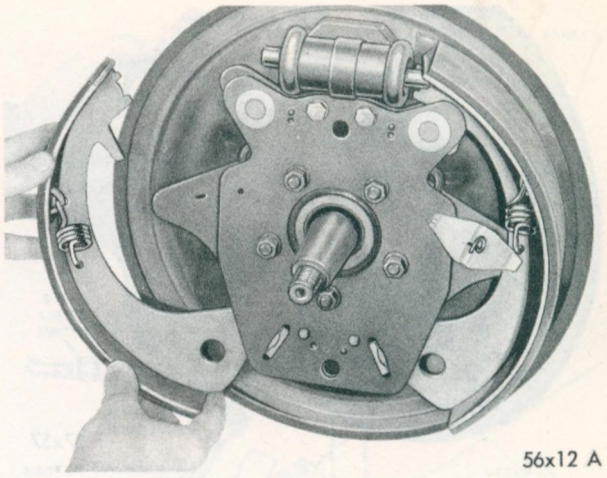

Fig. 14—Removing or Installing Rear Brake Shoe from Support Plate

(Fig. 14). Disconnect brake line at wheel cylinder. Install Tool C-745 to protect axle shaft outer seal, (Fig. 15). Remove five nuts and lockwashers that retain brake support plate and brake shield to axle housing and remove support plate (Fig. 16) wheel cylinder and dust shield as a unit. Remove wheel cylinder.

4. ASSEMBLY OF REAR BRAKE

Assemble wheel cylinder on brake shoe support plate. Install screws and lockwashers finger tight. Assemble brake shoe support plate assembly to brake shield.

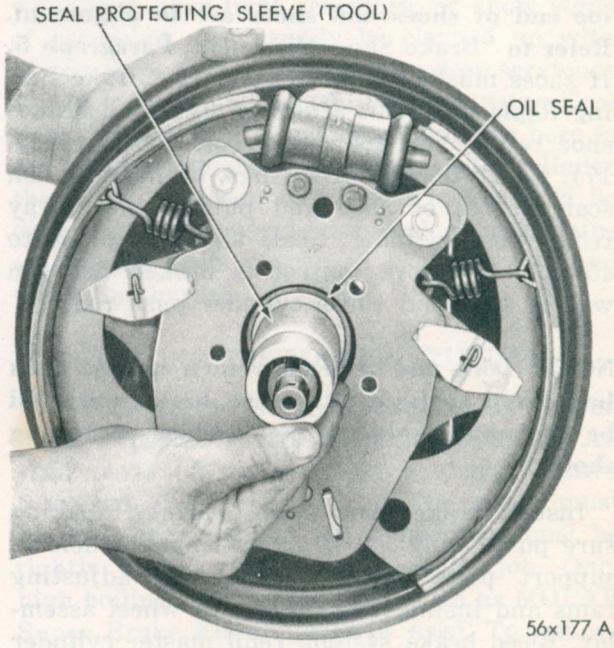

Fig. 15—Removing and Installing Rear Brake Support (Tool C-745)

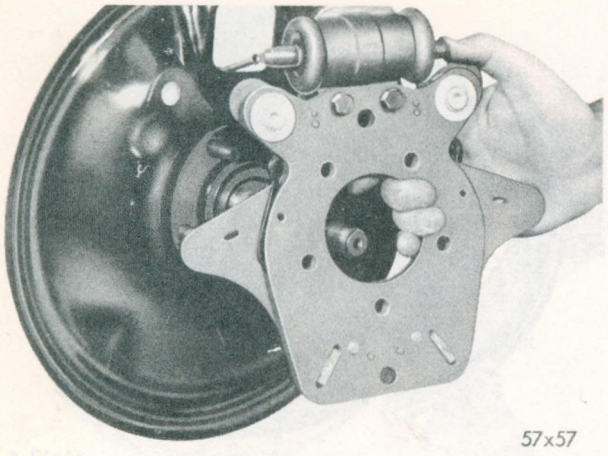

Fig. 16—Removing or Installing Rear Brake Support Plate

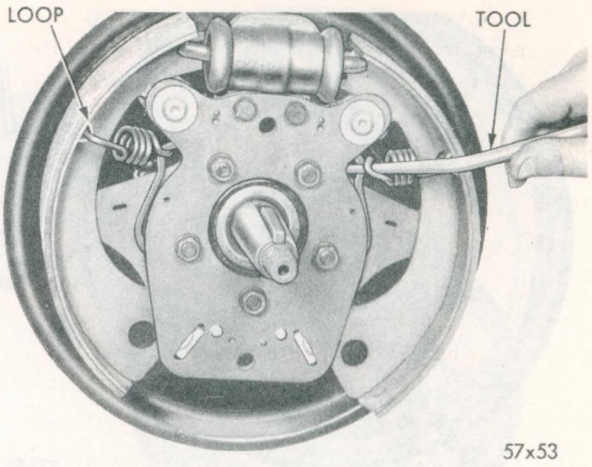

Fig. 17—Removing Rear Brake Shoe Return Spring with Tool C-3462

NOTE: Be sure brake adjusting cam rubber dust washers are in place and in good condition before installing brake support plate assembly. These washers are located between support plate and brake shield.

Position Tool C-745 (Fig. 15) and install brake shield, support plate and wheel cylinder. Tighten support plate screws 35 foot-pounds and wheel cylinder screws 20 foot-pounds torque. Connect brake fluid line to wheel cylinder.

Position brake shoes in support plate. **Make sure wheel cylinder push rods properly engage toe end of shoes and shoes are in alignment. Refer to "Brake Shoe Alignment. Paragraph 5.** If shoes must be relined, refer to "Brake Lining Replacement," Paragraph 6. Install brakes shoe return springs, using Tool C-3462 (Fig. 17). Check tension of springs, by hooking fish scale at toe of shoe and pulling shoe away from wheel cylinder. Scale should read 35 to 45 pounds before contact is broken between web of shoe and wheel cylinder push rod.

NOTE: Long end of brake return springs must be hooked in shoes. Otherwise, brake noise will be encountered due to coil springs contacting shoes.

Install brake shoe guide springs, making sure positioning lip of spring engages hole in support plate (Fig. 13). Loosen adjusting cams and install hub, drum and wheel assembly. Bleed brake system, refill master cylinder to proper level, and adjust brakes, as outlined in "Brake Adjustment", Paragraph 8.

5. BRAKE SHOE ALIGNMENT

To insure maximum braking effort, the entire length and width of lining must contact drum upon brake application. Examination of used lining will disclose if shoe is out of alignment. Misaligned shoes cannot be corrected by grinding and should be discarded. The brake shoe support plate assembly should also be checked. If it is sprung or damaged, replace with new support assembly.

6. BRAKE LINING REPLACEMENT

Pre-cemented Cyclebond brake lining can be successfully bonded to either new or used brake shoes.

NOTE: It is very important that equipment manufacturer's instructions be carefully ob-

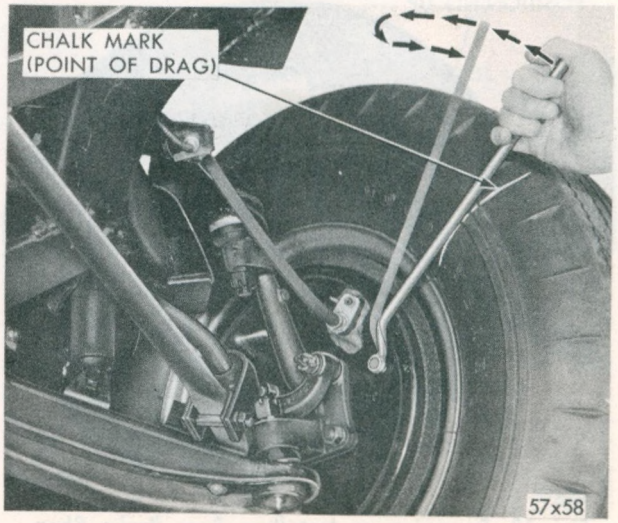

Fig. 18—Adjusting Brake Shoe at Cam

served for curing time, temperature, and clamping pressure (100 psi.), depending on type of equipment used.

7. GRINDING THE BRAKE LINING

NOTE: Brake shoes grinding must be done with brake shoes removed from vehicle.

Measure the drum diameter with an accurate micrometer. **Drum must not exceed .004 inch out-of-round at any point in drum.** The drum diameter is then transferred to grinding machine and lining is ground to specified clearance of .010 to .024 inch below drum diameter.

8. BRAKE ADJUSTMENT

NOTE: Whenever brakes have been relined or new shoe assemblies installed, always apply brake pedal prior to adjusting brakes. This action causes brake shoes to center themselves in brake drum and to assist in adjustment.

a. Front Brake Adjustment

Turn each adjusting cam (Fig. 18) on both front brakes in direction of forward wheel rotation (Fig. 19) until shoe lining is solid against drum and wheel is locked. Turn adjusting cams slowly in opposite direction (each cam a little at a time) until no drag is felt.

b. Rear Brake Adjustment

The forward rear wheel brake shoe adjusting cam are rotated in direction of forward wheel rotation. The rear wheel shoe adjusting cams are rotated in direction of reverse wheel rotation (Fig. 19).

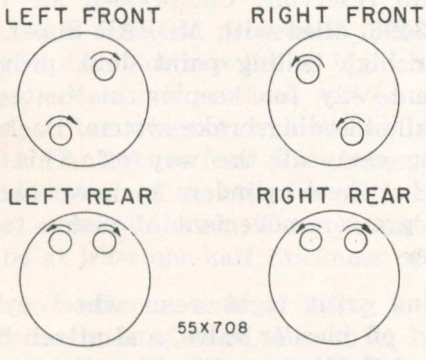

Fig. 19—Adjusting Front and Rear Brake Shoes (Orientation Diagram) (as Viewed Beneath Vehicle)

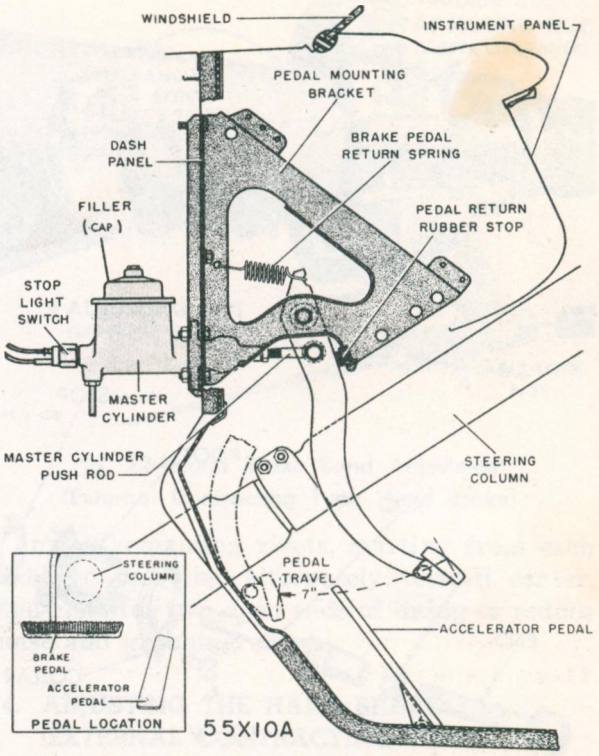

Fig. 20—Master Cylinder Location and Linkage (Typical)

9. SERVICING THE WHEEL CYLINDERS

Wheel cylinder pistons that are badly scored or corroded should be replaced. Use new piston cups when reconditioning cylinders. Cylinder walls that have light scratches, or show signs of corrosion, can usually be cleaned up with crocus cloth. Cylinders that have deep scratches or scoring, may be honed, however, using Tool C-3080, providing diameter of cylinder bore is not increased more than .002 inch. A cylinder that does not clean up at .002 inch should be discarded and new cylinder used. (Black stains on cylinder walls are caused by piston cups and will do no harm).

10. SERVICING THE MASTER CYLINDER

When servicing the hydraulic brake system, these important rules must be observed: All vital parts of system must be kept **CLEAN,** free from dirt, grease and oil. The system must be free from air and all connections must be tightly sealed upon completion of job. Only high boiling point brake fluid, such as MOPAR Super Brake Fluid should be used. To remove master cylinder, refer to Fig. 20, and proceed as follows:

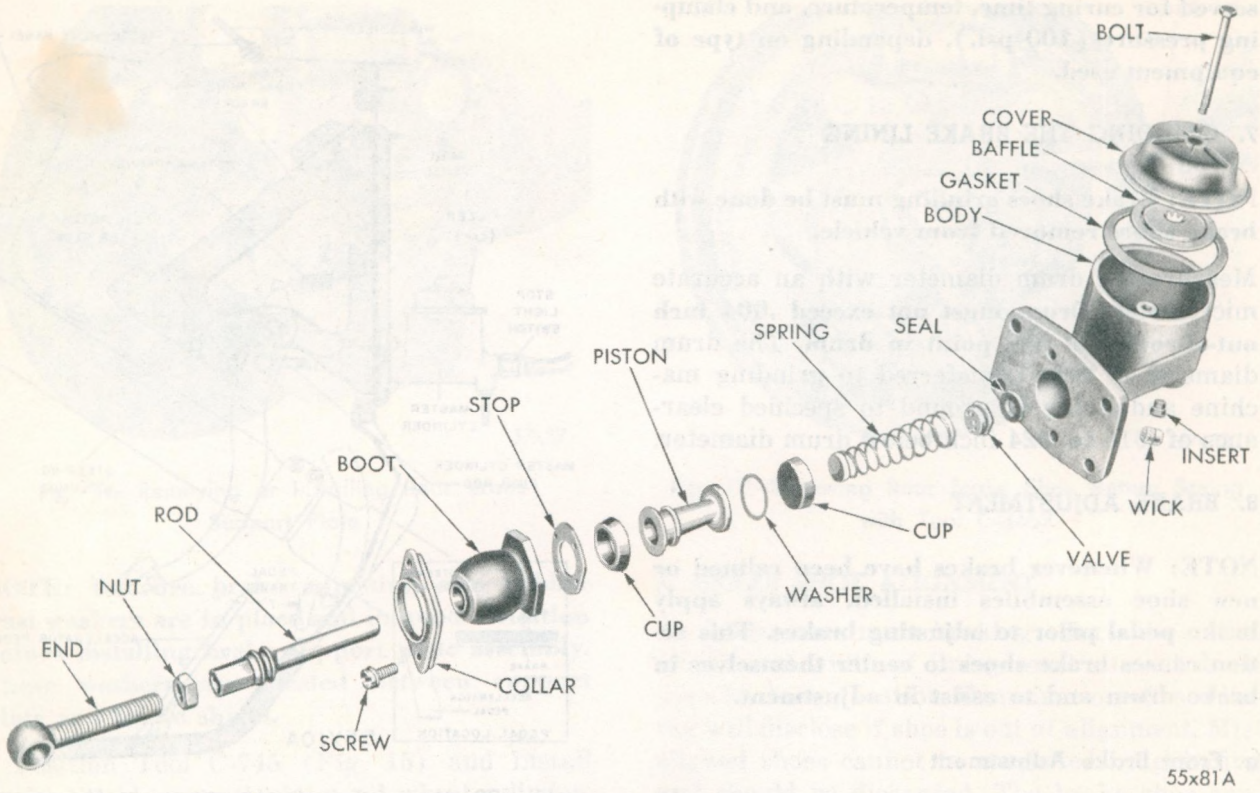

Fig. 21—Master Cylinder (Disassembled View)

Remove pedal return spring, disconnect push rod, and brake line tube at master cylinder. Disconnect stop light switch leads and remove master cylinder. Clean outside of master cylinder thoroughly, remove reservoir filler cap, and drain all brake fluid. Refer to Figure 21 and disassemble master cylinder for inspection. If master cylinder piston is badly scored or corroded, replace with new one. Piston cups and valve assembly should be replaced when reconditioning master cylinder.

Master cylinder walls that have light scratches or show signs of corrosion, can usually be cleaned with crocus cloth. Cylinders that have deep scratches or scoring may be honed, providing diameter of cylinder bore is not increased more than .002 inch. A master cylinder bore that does not clean up at .002 inch should be discarded and new cylinder used. (Black stains on the cylinder bore are caused by piston cups and will do no harm).

CAUTION

Use extreme care cleaning master cylinder after reconditioning. Remove all dust or grit by flushing cylinder with alcohol. Wipe dry with clean lintless cloth and clean second time with alcohol. Dry master cylinder with air pressure, and flush with clean brake fluid. (Be sure relief port in master cylinder is open.)

Before assembling, piston, cups and valve assembly should be dipped in new MOPAR Super Brake Fluid.

11. BLEEDING THE BRAKE SYSTEM

Remove any dirt around master cylinder reservoir filler cap so that dirt and grit will not drop into reservoir. Compressed air refiller, Tool C-3496, filled with MOPAR Super Brake Fluid or high boiling point fluid, provides a convenient way for keeping master cylinder filled while bleeding brake system. Back brake adjusting cams all the way off. This allows pistons in wheel cylinders to move back and permits greater movement of piston to expel air faster.

Starting with right rear wheel cylinder, wipe dirt off bleeder valve, and attach bleeder hose, Tool C-650, to valve. Place other end of hose in jar half full of brake fluid. Bleed intermittently, opening and closing valve (at

wheel cylinder) about every four seconds. This causes a whirling action in cylinder to help expel air. Continue this process until fluid runs out of bleeder hose in a solid stream without air bubbles. Continue bleeding by repeating this operation on left rear wheel, right front wheel, and left front wheel. At front wheels, bleed lower cylinder first to force all air out of connecting line.

If necessary, repeat bleeding operation when there is an indication of air remaining in system. **Be sure to adjust cams after completion of bleeding operation.**

12. TEST FOR FLUID CONTAMINATION

To determine if contamination exists in brake fluid (indicated by swollen or deteriorated rubber cups), make following test: Place small amount of drained brake fluid in small glass bottle. Separation of fluid into two distinct layers will indicate mineral oil content. Add water to contents and shake. If fluid becomes milky, oil is present. If fluid remains clear, it is not contaminated with mineral oil. **Be safe and discard old brake fluid that has been bled from system. Fluid drained from bleeding operation may contain dirt particles or other contamination and should not be used.**

13. SERVICING THE HAND BRAKE (EXTERNAL CONTRACTING TYPE)

a. Removal and Installation

Remove adjusting bolt and nut. Remove guide bolt adjusting lock nut and guide bolt nut and bolt (Fig. 22). Remove anchor adjusting screw and band assembly.

b. Relining Hand Brake Band (Band Removed)

When band is removed, proceed as follows: Remove old lining. Cut new lining ¼ inch longer than required length so there will be a slight bulge at center when it is installed in band. Drill and counterbore four rivet holes (two at each end of lining) to coincide with holes at extreme ends of band. These counterbores should be at least one-half thickness of lining.

Rivet two extreme ends of lining to respective extreme ends of band. Due to ¼ inch excess length, lining will now bulge slightly at center of band. Snap this lining in against band to make an even tight fit.

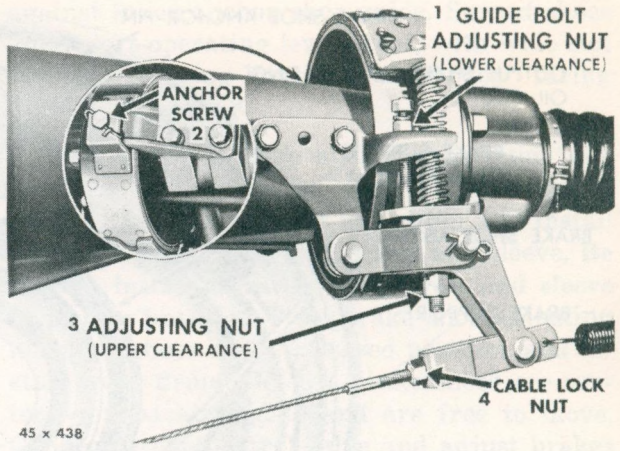

Fig. 22—Hand Brake Band Adjustment (External Contracting Type Hand Brake)

Install remaining rivets, starting from each end and working alternately toward center. End-chamfer two open ends of lining to reduce noise and grabbing effect.

14. ADJUSTING THE HAND BRAKE (EXTERNAL CONTRACTING TYPE)

Set hand brake lever in fully released position.

NOTE: Before adjusting brake, be sure that free play (between anchor bracket on center of band and sides of hand brake support) does not exceed .005 inch. Otherwise, band distortion may result upon application of brake. This free play, if excessive, may be reduced by compressing anchor bracket in vise or tapping it gently with hammer against block or anvil.

Remove lock wire. Using feeler gauge, adjust anchor screw (Fig. 18) so that clearance between band and drum at anchor is .015 to .020 inch. Lock anchor screw securely. Adjustment of guide bolt (Fig. 22) should be such that both upper and lower half of band has a like amount of clearance. The guide bolts move lower half of band up to keep upper half of band from dragging and causing premature wear. Adjusting bolt nut controls upper half of band. Turn adjusting bolt nut (Fig. 22) until there is just a slight drag on drum, with upper and lower half having an equal amount of clearance.

CAUTION

The lockwire which retains anchor bolt must not be drawn up tight. This restriction will cause uneven wear and a poor brake.

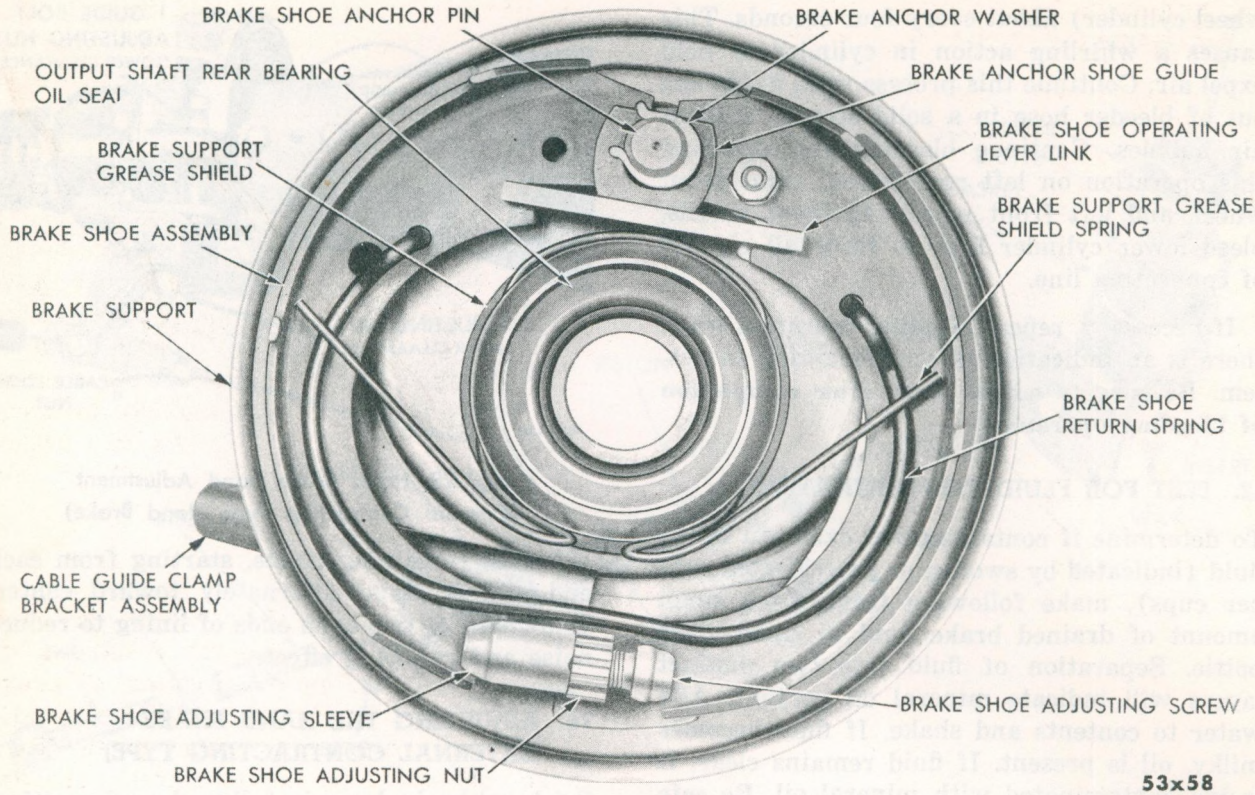

Fig. 23—Internal Expanding Type Hand Brake

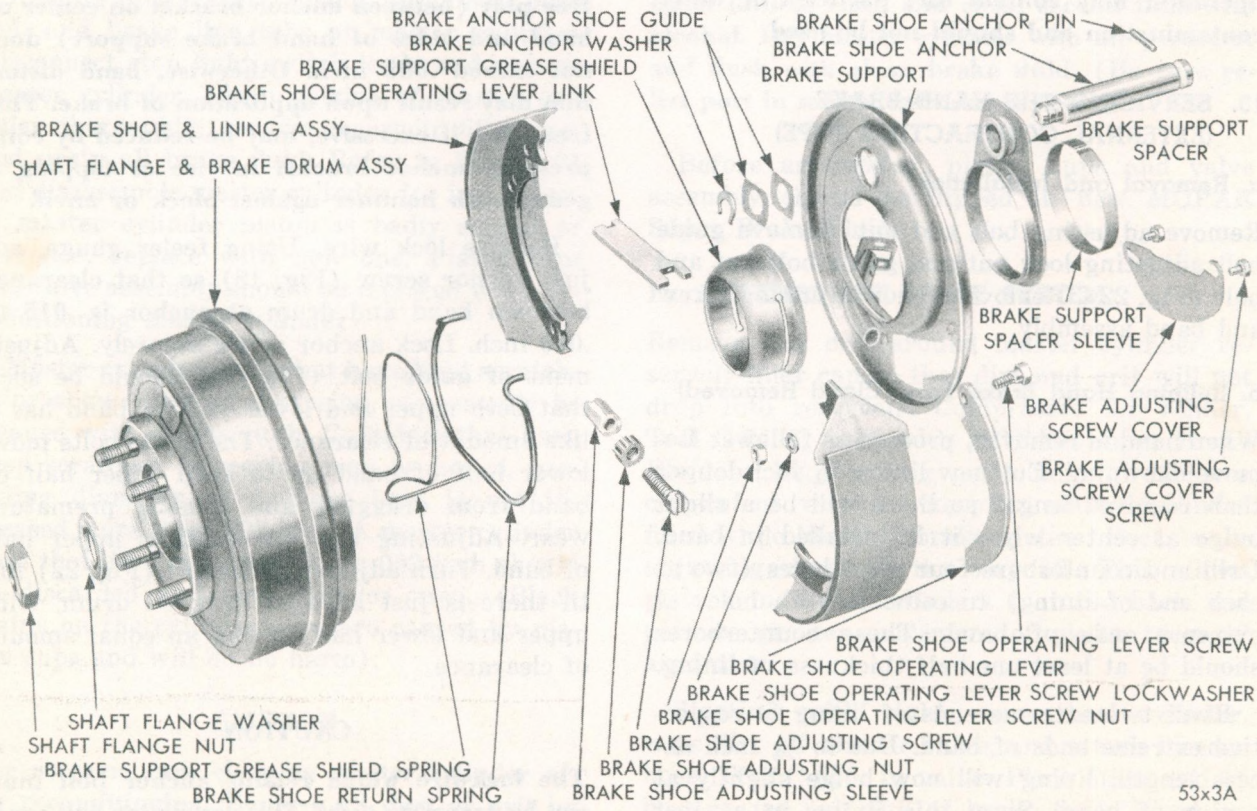

Fig. 24—Hand Brake (Internal Expanding Type) (Disassembled View)

15. ADJUSTING HAND BRAKE CABLE (EXTERNAL CONTRACTING TYPE)

After long service, the cable may stretch to such an extent that pulling back on hand brake lever will not apply band to drum. Loosen cable lock nut (Fig. 22), remove clevis pin from yoke, and turn yoke until cable slack is taken up. Make certain that lock nut is tightened after assembly. (This is not a substitute for hand brake adjustment.)

16. SERVICING THE HAND BRAKE (INTERNAL EXPANDING TYPE)

The hand brake (Fig. 23) is internal expanding type and is used only on cars equipped with Torque-Flite Transmission. The brake is fully enclosed to keep out dirt and oil and requires very little servicing. Longer lining life is assured by protection against dirt and by use of Cyclebond linings. Adjustment, when needed, are very simple for both steel control cable and shoes.

a. Disassembly

To service the internal expanding hand brake, refer to Fig. 24, and proceed as follows: Disconnect propeller shaft at transmission. Engage holding Tool, C-3281, with companion flange. Loosen and remove companion flange nut, lockwasher and flatwasher. Install puller, Tool C-452, on companion flange and remove flange and brake drum. Remove brake adjusting screw cover and disengage ball end of cable from operating lever. Separate shoes at bottom, allowing brake shoe adjusting nut, screw and sleeve to drop out, and release shoes. Remove brake shoe return spring.

Pry out brake shoe anchor washer and remove outer shoe giude. Slide each shoe out from under brake support grease shield spring. (As shoes are removed, operating strut lever will drop out of plate.) Separate operating lever from right-hand brake shoe by removing nut, lockwasher and bolt. The brake is now disassembled as necessary for replacement of worn or damaged parts.

b. Assembly

Assemble operating lever to right-hand brake shoe. Slide right and left-hand brake shoes under brake support grease shield spring and up against inner anchor shoe guide. Spread shoes and insert operating lever strut, with wide slot toward operating lever and word "top" facing up.

Replace outer brake anchor shoe guide and washer. Replace brake shoe return spring. Spread both shoes apart at bottom and install brake shoe adjusting nut, screw and sleeve. **Be sure to install adjusting nut, screw and sleeve in proper position.** Turn brake shoe adjusting nut until shoes are in released position, and install brake drum. Be sure brake shoes are centered on backing plate and are free to move. Connect brake control cable and adjust brakes and control cable. See "Adjustment" "C". Replace the adjusting screw cover plate.

c. Adjustment

Push in Neutral (N) push button. Be sure hand brake is released. Disconnect front end of propeller shaft to permit turning of brake drum by hand (if not previously disconnected). Remove adjusting screw cover plate. Turn brake shoe adjusting nut to decrease shoe-to-drum clearance until slight drag is felt on drum. Back off adjusting nut at least one full notch (using spanner wrench, Tool C-3014) to give approximately .010 inch clearance. **Be sure two raised shoulders on adjusting nut are seated in grooves on adjusting sleeve.**

Test hand brake lever for travel. When it is properly adjusted, there should be from 3 to 5 notches on lever rod visable beyond face plate. **Never substitute for a brake shoe adjust-**

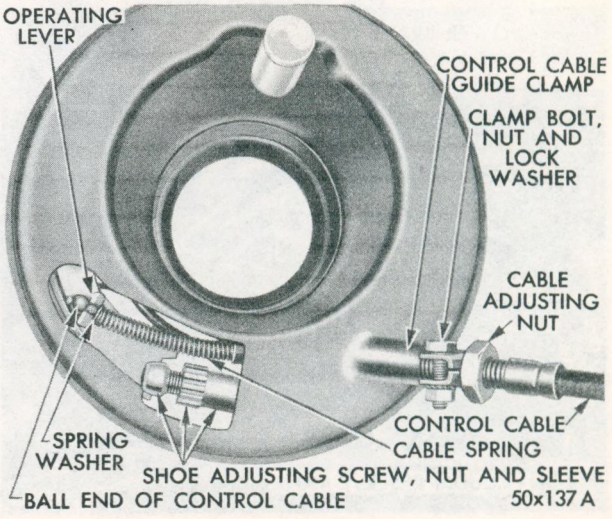

Fig. 25—Rear View of Brake (Typical)

ment by adjusting cable. Install adjusting screw cover plate and connect propeller shaft.

17. SERVICING HAND BRAKE CABLE (INTERNAL EXPANDING TYPE)

a. Removal (At Transmission End)

If removal of control cable is required for replacement or repair, refer to Fig. 25, and proceed as follows. Loosen guide clamping bolt and remove adjusting screw cover plate. Pry ball end of cable up and out of operating lever slot with a screwdriver. Remove control cable from guide.

b. Installation

Slide cable into guide. Insert installer, Tool C-3015, between spring retainer washer and ball on end of cable. Hook cable into slot in operating lever, with lever betwen ball and washer.

c. Adjustment

After installation has been completed, adjust cable as follows: The cable length adjusting nut should be positioned against cable housing so there is at least .005 inch, but not more than .010 inch, clearance between operating lever brake shoe cable.

To lock adjustment, tighten cable housing clamp securely and tighten cable adjusting nut against housing. Never substitute cable adjustment for brake shoe adjustment.

18. CYCLEBOND BRAKE LINING

Pre-cemented Cyclebond brake lining can be applied to either new or used shoes. See instructions in MOPAR Shop Replacement Packages.

POWER BRAKE UNIT (BELLOWS TYPE)

SERVICE PROCEDURES

The Bellows Type Booster unit is an oval-shaped, air-vacuum bellows mounted on engine side of dash panel, and is connected mechanically to brake pedal linkage through power unit push rod (Figs. 26 and 27). The unit is an air suspended unit and therefore, requires a vacuum reserve tank, which is mounted on the engine side of the front fender splash shield. Brake linkage exists only when the unit is assisting in a brake application. With a loss of engine vacuum, the brake pedal is free to move completely, independent of the Power Unit to apply the brakes in the conventional manner.

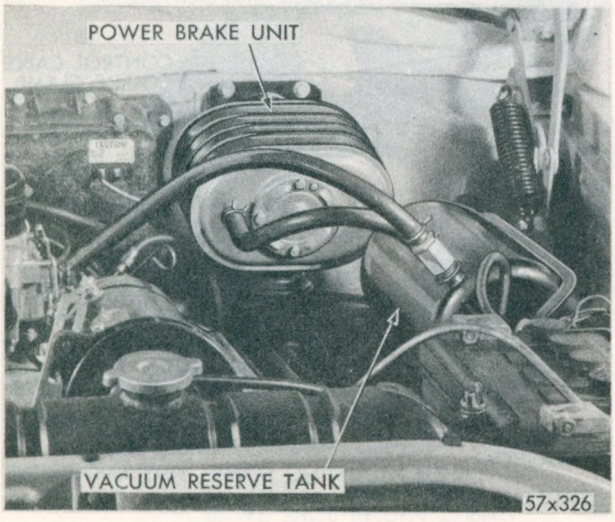

Fig. 26—Power Brake (Installed)

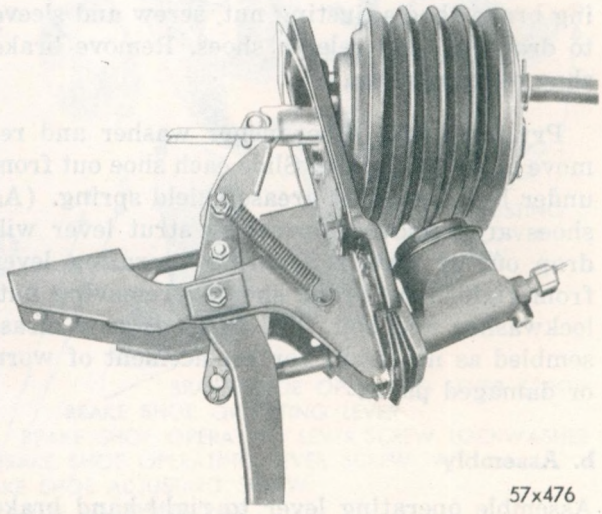

Fig. 27—Bellows Type Power Brake Unit and Linkage Installation

19. REMOVAL OF POWER BRAKE UNIT

Use pedal depressor, depress pedal to prevent trigger arm from extending beyond extremities of bracket.

NOTE: If pedal linkage is allowed to extend through hole in dash panel, trigger arm may be damaged.

Disconnect vacuum hose at power vent. Remove complete power unit and bracket assembly by removing four hex nuts and lockwashers. Carefully withdraw unit from dash panel (Fig. 27).

NOTE: Use care to prevent loss of nylon bushing on pedal linkage cross pin.

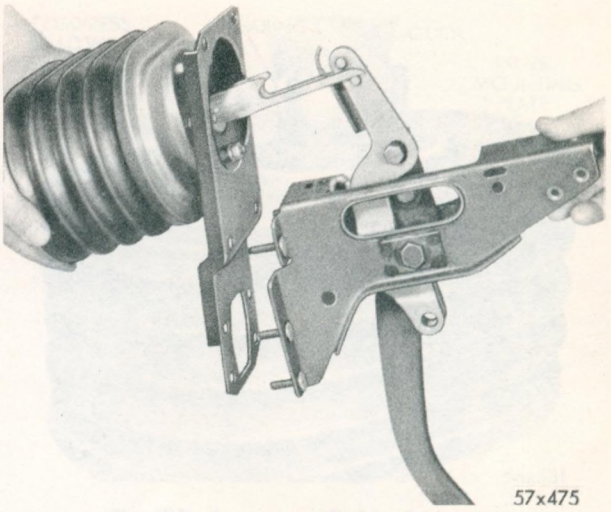

Fig. 28—Removing or Installing Power Brake Unit (Bellows Type Shown)

20. DISASSEMBLING POWER BRAKE

Should it be necessary to disassemble bellows type power brake unit for overhaul or repair, refer to Figs. 29 and 30, and proceed as follows: Remove nuts that attach mounting plate to unit. Slide plate off and away from unit. Remove and discard mounting plate "O" ring.

Using an Allen wrench, back out two set screws sufficiently to allow removal of yoke (Fig. 31). Slide yoke off end of guide and away from unit. (Slightly compress bellows by hand for clearance when loosening set screw). Remove rubber stop seal washer. Lift valve operating rod out of unit, remove, and discard valve operating rod button seal (Fig. 32).

Remove nuts that attach outer mounting plate. Using screwdriver, pry up gently on plate to loosen. Lift plate straight up and away from unit. Discard "O" ring. Compress bellows

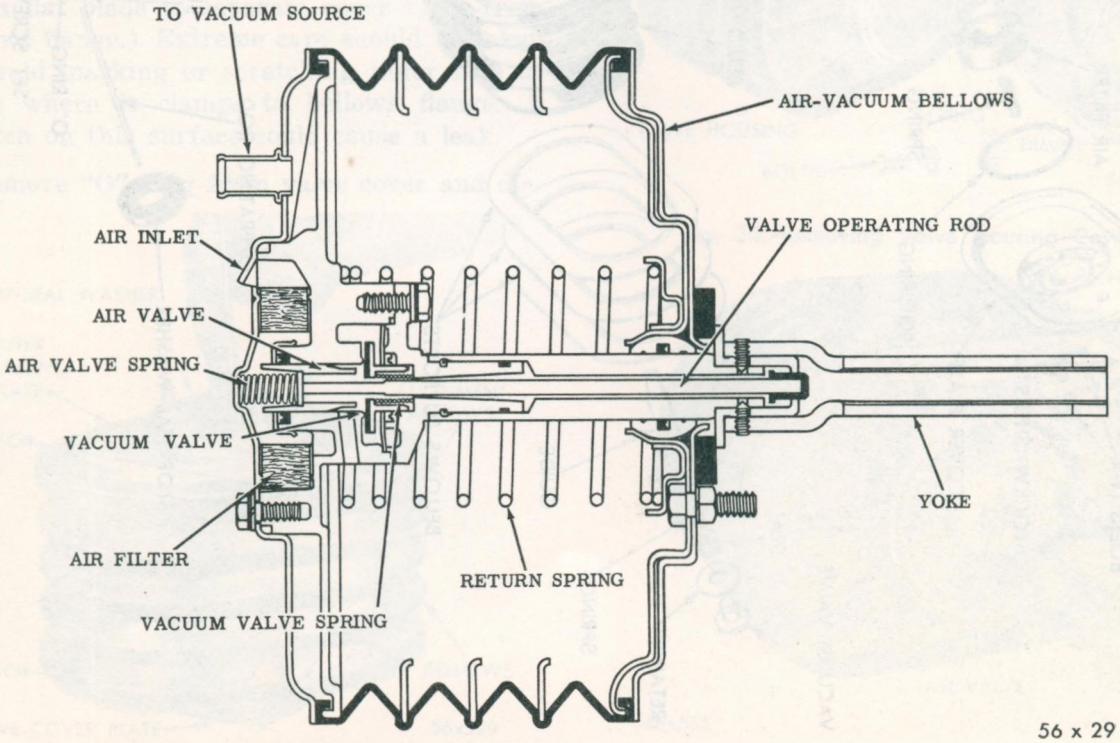

Fig. 29—Bellows Type Power Brake (Sectional View)

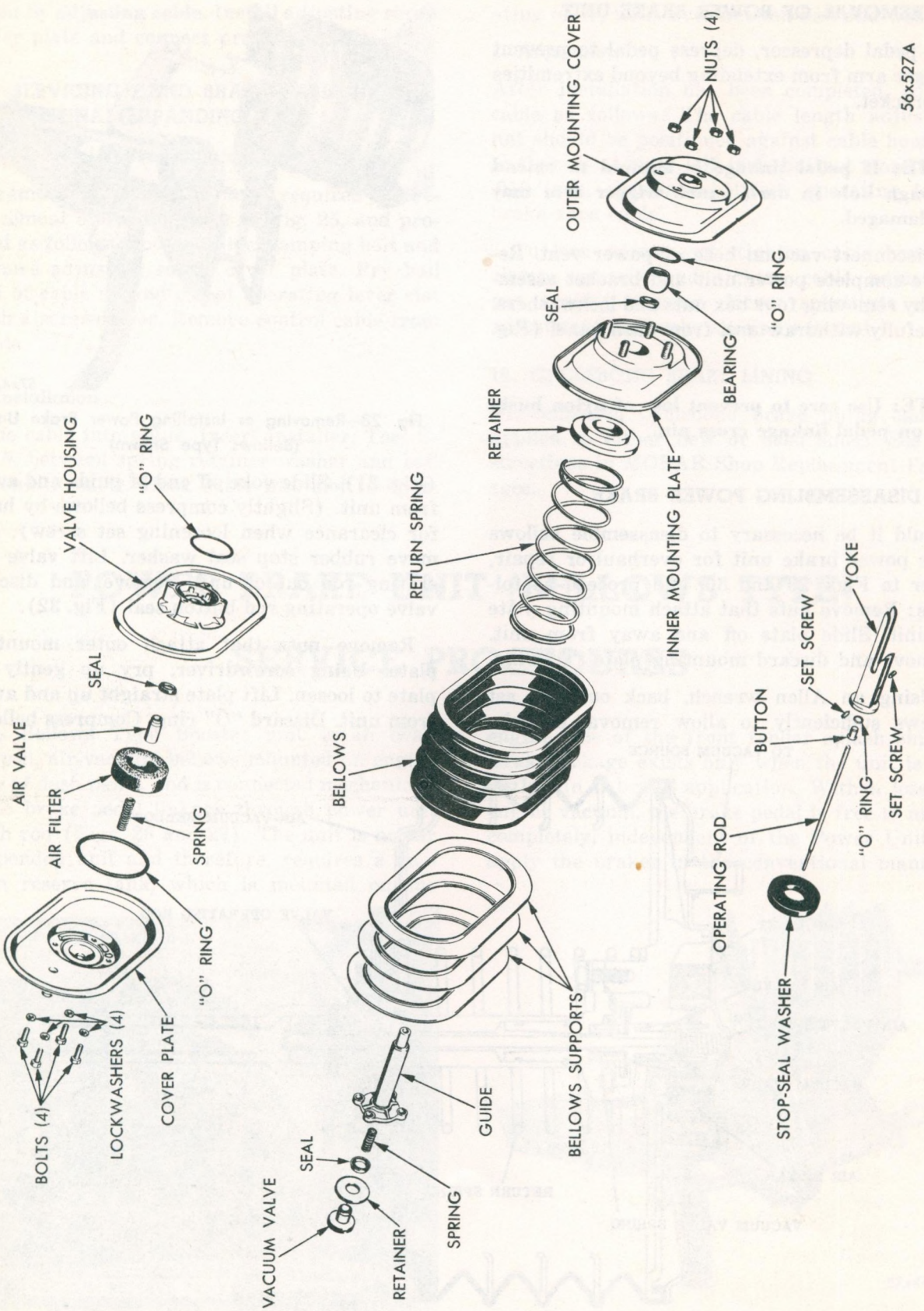

Fig. 30—Bellows Type Power Brake (Disassembled View)

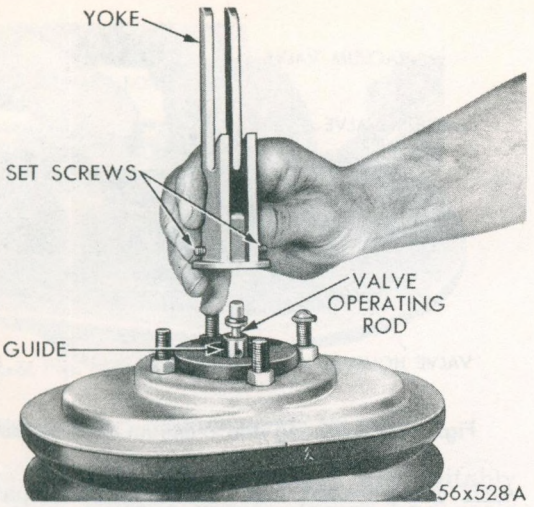

Fig. 31—Removing or Installing Yoke

by hand sufficiently to expose guide bearing. Slide bearing off end of guide (Fig. 33). Remove and discard bearing seal from inside bearing. Peel back outer lip of bellows completely around inner mounting plate. (Keep one hand on inner mounting plate to prevent it from snapping up). Remove plate and lift out return spring and return spring retainer. Place unit on its side and remove bolts and lockwashers that attach valve cover to valve. Lift off cover (Fig. 34). (If it is necessary, use a flat blade to separate cover plate from bellows flange.) Extreme care should be taken to avoid marking or scratching inner face of plate where it clamps to bellows flange. A scratch on this surface could cause a leak.

Remove "O" ring from valve cover and discard. Remove air valve spring from center of valve. Remove air filter and slide air valve out of housing (Fig. 35). To remove valve, it may be necessary to use a hook formed from paper clip. Place valve housing end down on bench.

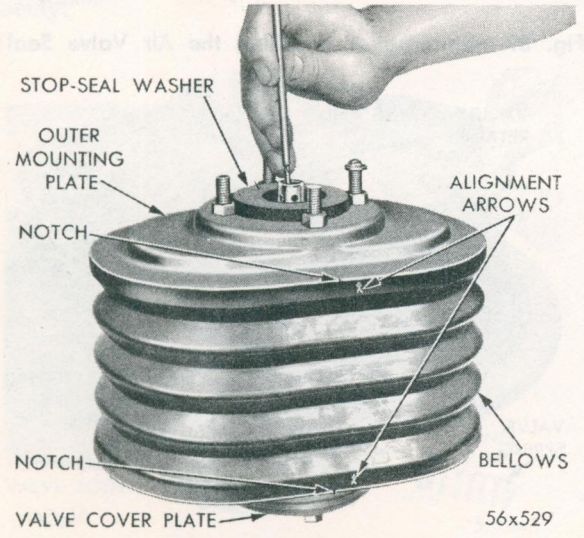

Fig. 32—Removing or Installing Operating Rod

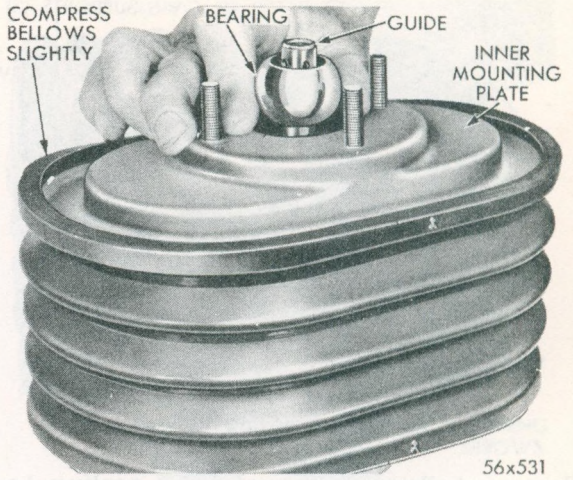

Fig. 33—Removing Guide Bearing

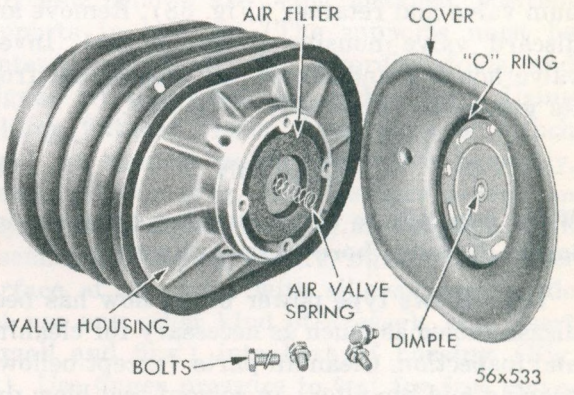

Fig. 34—Removing Valve Housing Cover

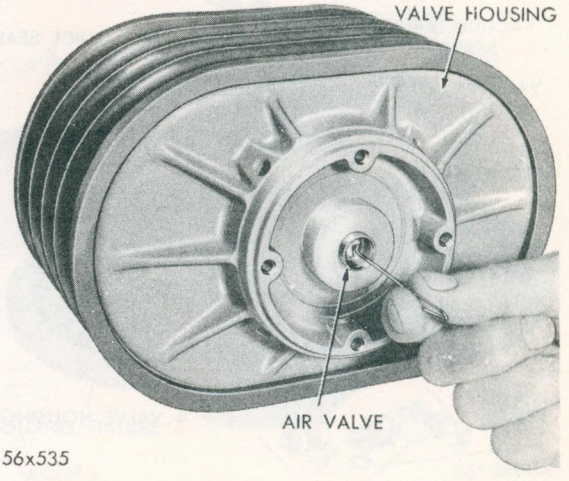

Fig. 35—Removing Air Valve

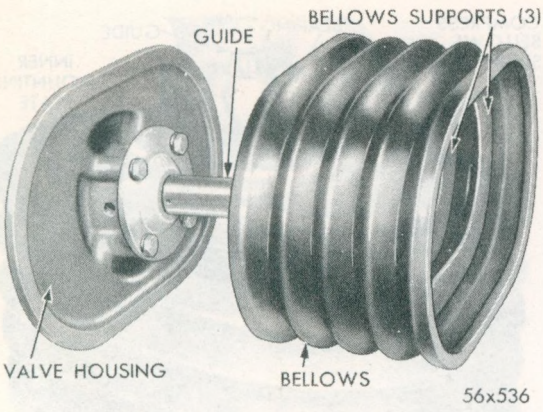

Fig. 36—Removing Bellows

Remove bellows from valve by peeling back outer lip of bellows (Fig. 36). Lift bellows up and away from valve. If new bellows is to be installed, remove 3 bellows support.

Remove bolts and lockwashers that attach guide to valve body. Lift off guide to expose vacuum valve, valve spring and seals (Fig. 37). Remove seals and discard them. Lift out vacuum valve and retainer (Fig. 38). Remove and discard valve housing to guide seal. Invert valve housing and remove air valve seal from its groove in valve body (Fig. 39).

CAUTION

Work carefully to avoid marking or scratching inside diameter bore of valve housing.

The bellows type power brake now has been disassembled as much as necessary for cleaning and inspection. Clean all parts (except bellows, bearing and air filter) in solvent and blow dry

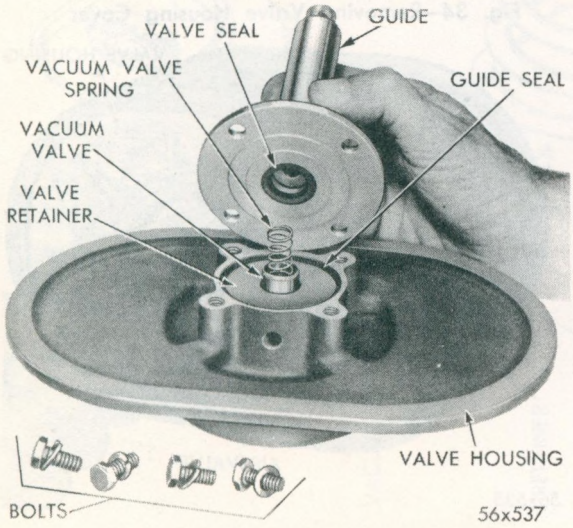

Fig. 37—Removing or Installing Guide

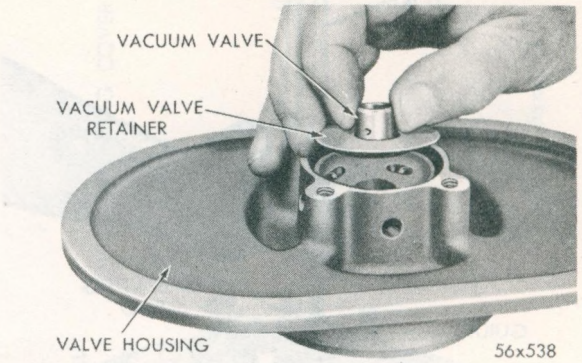

Fig. 38—Removing the Vacuum and Retainer

with compressed air. Place cleaned parts on clean paper for reassembly. If necessary, bellows may be washed with water and mild soap. Inspect all parts for wear or damage and check air valve for signs of scoring or wear. If valve body or valve is scored or worn, install new parts as required. **Always use new "O" and seal rings.**

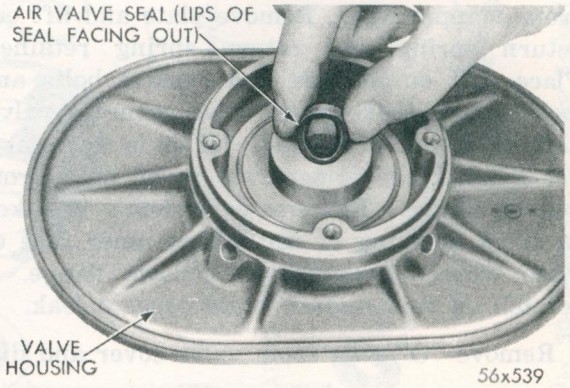

Fig. 39—Removing or Installing the Air Valve Seal

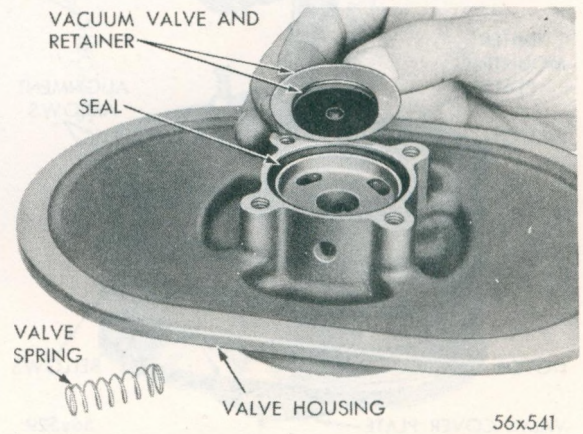

Fig. 40—Installing the Vacuum Valve and Retainer

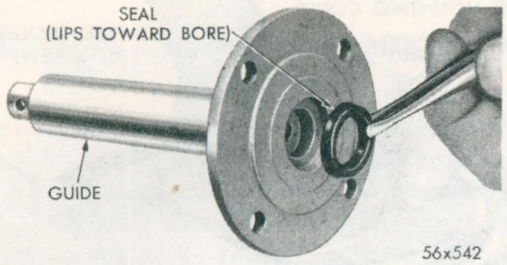

Fig. 42—Installing the Bellows

21. ASSEMBLING THE POWER BRAKE

Be sure all seals and "O" rings are suitably coated with silicone grease (rings and seals precoated in Parts Kits). Assemble as follows: Insert new air valve seal into bore of valve housing (lips of seal facing out when installed). (Refer to Fig. 39). Carefully position new vacuum valve in retainer. Invert valve housing and install vacuum valve and retainer in housing. Press down firmly on retainer to snap it in place. (Fig. 40)

Position new valve housing to guide seal in groove provided. Install new vacuum valve seal in bore guide, with lip of seal toward bottom of bore (Fig. 41). Install vacuum valve spring in center of valve. Position guide over vacuum valve, lining up bolt in guide with bolt holes in valve body. Carefully lower guide down against valve body, making certain tapered portion of vacuum valve enters seal evenly. Press down on guide to seat and install bolts and lockwashers. Tighten bolts evenly and securely.

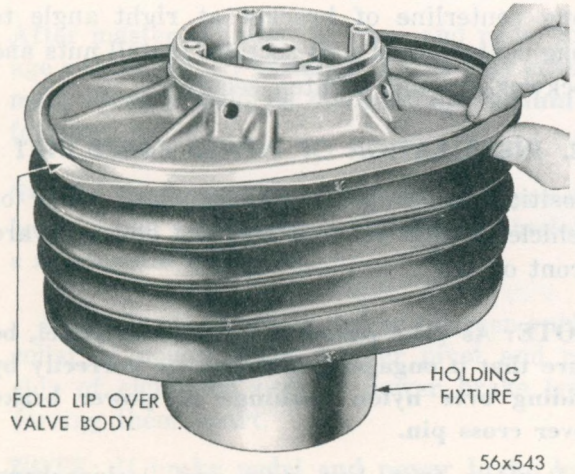

Fig. 41—Installing the Vacuum Seal

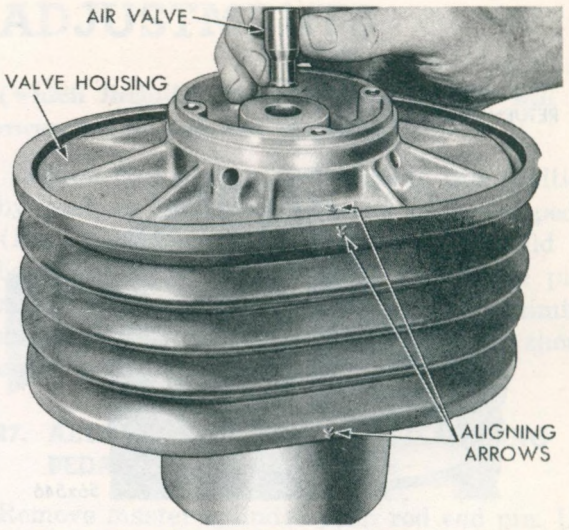

Fig. 43—Installing the Air Valve

CAUTION

Be sure countersunk holes at end of guide, line up with long centerline of valve housing.

If new bellows are being installed, position supports in bellows. (The supports must be centered in three center accordion folds, and aligned with bellows and each other.) Using holding fixtures (made from piece of 4-inch pipe) to support guide and valve assembly, install bellows (Fig. 42). **Be sure arrows on edge of bellows and housing are aligned.** With assembly in holding fixture, lightly coat outer surface of air valve with silicone grease (do not use any other kind of grease), and insert (small and first) into bore of housing (Fig. 43). Use finger pressure to test for free movement of valve against vacuum valve spring.

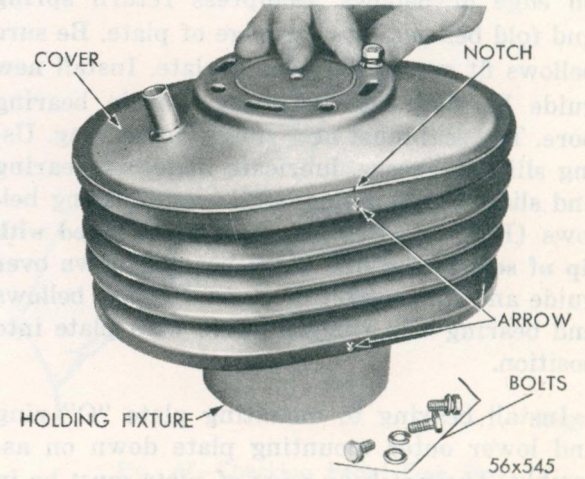

Fig. 44—Installing Valve Housing Cover

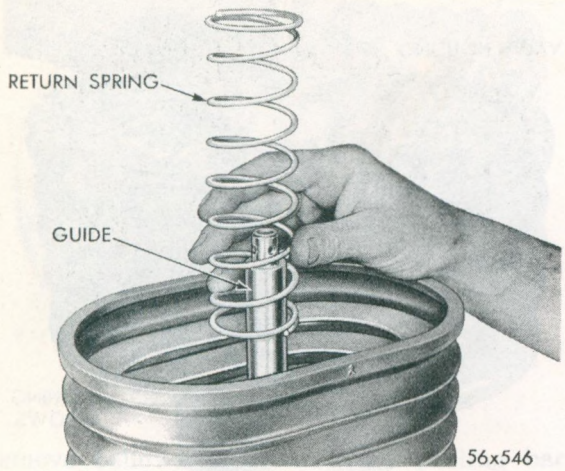

Fig. 45—Installing Return Spring

Install air valve spring in recess in air valve and air filter. Install new valve housing cover "O" ring on shoulder provided on valve body hub. Position valve body cover over valve housing, with notch in edge of cover matching arrow on bellows (Fig. 44). Be sure air valve spring nestles on dimple in center of cover. Press cover down evenly over valve housing to seat cover "O" ring, install bolts, and tighten securely.

Remove assembly from holding fixture and invert unit. Coat guide lightly with silicone grease and install return spring. Position spring evenly around hub of valve housing and guide (Fig. 45). Place spring retainer and inner mounting plate over spring, being sure arrow stamped on plate is in line with arrow on edge of bellows. Compress return spring and fold bellows lip over edge of plate. Be sure bellows fit evenly all around plate. Install new guide bearing seal in groove inside bearing bore. The seal must nest snugly in bearing. Using silicone grease, lubricate inside of bearing and slide it over guide, while compressing bellows (Fig. 46). **Bearing must be installed with lip of seal facing out.** Push bearing down over guide and into pocket of plate. Release bellows and bearing will ride up guide with plate into position.

Install bearing to mounting plate "O" ring and lower outer mounting plate down on assembly. **The notch on edge of plate must be in line with arrow on bellows.** Install nuts and

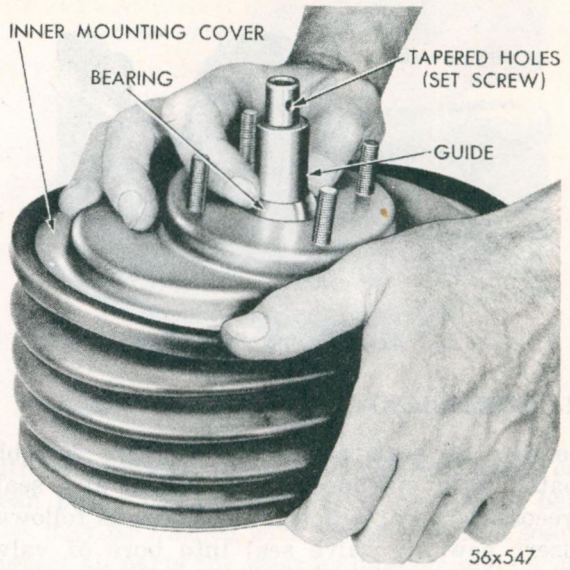

Fig. 46—Installing Guide Bearing

draw down finger tight. Slide new valve operating rod seal ring over nylon bumper on end of rod and into groove. Install rod in center of guide. Press on end of rod to test for free operation or movement of air and vacuum valves. A "two step" movement should be felt when rod is depressed and released fully. Place new stop-seal washer in position and install yoke on end of guide. Compress bellows slightly and alternately tighten set screws. **The hub of yoke must be down snug against shoulder of guide, with set screws aligned with tapered holes in guide.** Tighten mounting plate nuts securely.

Place mounting bracket in position, with long centerline of bracket at right angle to long centerline of unit section. Install nuts and lockwashers and tighten securely.

22. INSTALLATION OF POWER BRAKE UNIT

Position power brake unit on dash panel of vehicle so that its axis inclines down toward front of car.

NOTE: As yoke passes through dash panel, be sure that it engages pedal linkage correctly by sliding over nylon bushings on power brake lever cross pin.

Replace four hex nuts and lockwashers, tighten nuts securely, and release pedal.

PEDAL LINKAGE ADJUSTMENTS

23. PEDAL LINKAGE ADJUSTMENTS (ON CAR) (FIG. 47)

It should seldom be necessary to adjust brake pedal trigger arm. Adjustment however, may be necessary, occasionally, to eliminate the following conditions: If pedal pressure releases slowly, adjust by rotating adjustment screw in **counter-clockwise direction.** A time delay (noted during a fast brake application), can be corrected by making a **clockwise** adjustment on adjusting screw. Should pedal vibrate (booster chatter), turn adjusting screw in counter-clockwise direction (Fig. 47).

NOTE: Rotation of adjustment screw should be limited to plus or minus 90 degrees about original setting.

24. ASSEMBLY OF PEDAL LINKAGE IN PEDAL BRACKET

CAUTION

Use extreme care during assembly or handling of linkage as power brake pedal trigger arm is easily damaged.

25. LUBRICATION

Except for an occasional few drops of SAE 10-W Engine Oil on power brake lever pin bushings, brake pedal linkage requires no further lubrication. The power unit will require no lubrication under normal usage.

26. PEDAL FREE PLAY ADJUSTMENT

After master cylinder, booster, and pedal linkage are completely installed, a free play adjustment check should be made at **no vacuum** as follows:

NOTE: Removing vacuum hose and pressing brake pedal several times will aid in obtaining a no vacuum condition.

Insert blade of screw driver between rubber collar of power brake trigger pivot and rear side of elongated hole in power brake lever, forcing them apart.

NOTE: If brake pedal and power brake lever are not wedged apart, a false free play setting (which includes booster valve travel) will be measured at pad end of pedal.

Check free play with linkage in this position by pushing lightly at pad end of brake pedal (Fig. 47). Pedal free play travel should be between $\frac{1}{32}$ and $\frac{1}{8}$ inch. If pedal free play movement does not come within required limits, adjustment is made by lengthening or shortening push rod as required.

27. ALTERNATE METHOD OF MEASURING PEDAL FREE PLAY

Remove master cylinder push rod end pin. Using **light** finger pressure, move push rod forward until contact is made with master cylinder piston. Attempt to insert push rod end pin through power lever and push rod end hole. If push rod must be pulled back to allow passage of push rod end pin, free play is present. If push rod must be pushed further into master cylinder to allow passage of push rod end pin, no free play is present and an adjustment must be made at push rod.

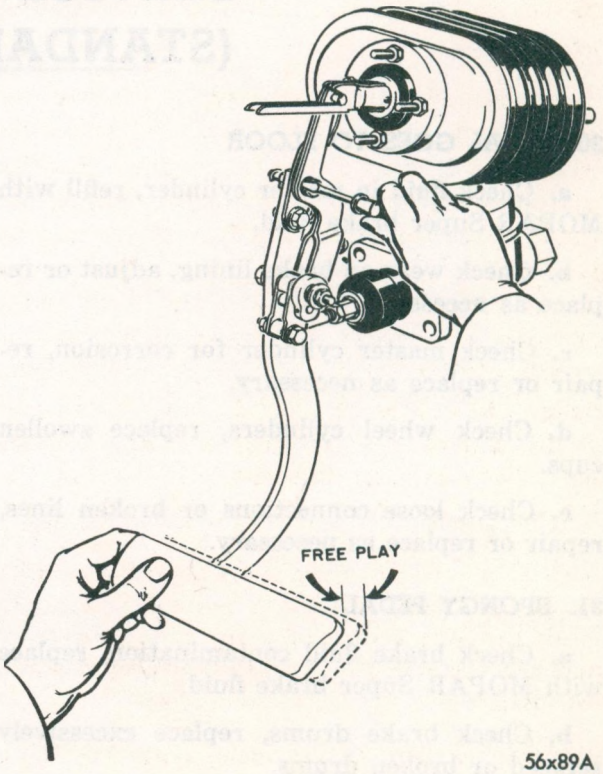

Fig. 47—Checking Pedal Free Play (Bellows Type, Typical of Piston Type)

28. SERVICING THE MASTER CYLINDER

The master cylinder can be bled and push rod end assembled at proper length, as described in this section. The length from push rod end hole to master cylinder mounting face has changed however, because of difference in brake pedal linkage. The distance from push rod end hole to master cylinder face is 4.7 inches. The service procedures covering master cylinder are the same as on standard master cylinder.

29. TESTING BRAKE SYSTEM

With unit completely assembled and installed on vehicle, make following vacuum and hydraulic leakage test. Operational test should also be made to determine that brake power unit and hydraulic brake system is operating up to standard.

Road test car and make brake applications at about 20 m.p.h. If brake pedal has a spongy feel when brakes are applied, air is present in hydraulic systems and lines must be bled. Bleed brake system at each wheel cylinder.

With engine not running, apply brakes several times to exhaust all vacuum in system. Depress brake pedal, hold foot pressure on pedal and start engine. As soon as engine begins to operate, brake pedal will tend to fall away under foot pressure, and less pressure will be required to hold pedal in applied position.

If there is **NO** noticeable difference in pedal effect with or without engine running, vacuum system is not functioning. Check for restriction in vacuum supply line, restriction on air cleaner, faulty pedal adjustments, or faulty power unit operation. Stop engine and again exhaust all vacuum in system. Depress brake pedal and hold foot pressure on pedal. If pedal gradually falls away under foot pressure, hydraulic system is leaking. If brake pedal travels to within one inch of toe board, brake shoes require re-adjustment or relining.

SERVICE DIAGNOSIS (STANDARD BRAKES)

30. PEDAL GOES TO FLOOR

a. Check fluid in master cylinder, refill with MOPAR Super brake fluid.

b. Check wear on brake lining, adjust or replace as necessary.

c. Check master cylinder for corrosion, repair or replace as necessary.

d. Check wheel cylinders, replace swollen cups.

e. Check loose connections or broken lines, repair or replace as necessary.

31. SPONGY PEDAL

a. Check brake fluid contamination, replace with MOPAR Super brake fluid.

b. Check brake drums, replace excessively refaced or broken drums.

c. Air in brake system, bleed brakes using air-less bleeder tank unit, Tool C-837.

32. BRAKES PULLING TO ONE SIDE

a. Check tires, inflate to proper pressure.

b. Check brakes, adjust for proper clearance.

c. Check drums for out-of-round, machine drums and replace with brake shoes to fit drum.

d. Check brake shoes for twist, straighten, reline, or grind to fit drum.

e. Oil, grease or brake fluid on shoes, clean with alcohol.

f. Check brake lining, replace with matched lining.

33. SQUEALING BRAKES

a. Check lining, replace with proper lining.

b. Check brake drum, clean or reface as necessary.

c. Check brake shoes, straighten or replace as necessary.

d. Check brake support plate, straighten or replace.

e. Check brake shoe return spring, replace as necessary.

34. DRAGGING BRAKE

a. Check brake adjustment.

b. Check hand brake, that it is fully released.

c. Check wheel cylinders, repair or replace as necessary.

d. Check brake shoe return spring, replace worn or broken springs.

e. Excessive brake adjustment, adjust to proper clearance.

f. Brake pedal binding, loosen pedal across shaft.

35. HARD PEDAL

a. Check brake shoe lining, replace with proper lining.

b. Check by-pass port in master cylinder, repair or replace as necessary.

c. Check push rod, make proper adjustments.

36. WHEEL LOCKS

a. Check brake lining, replace torn or loose lining.

b. Check wheel bearings, adjust to proper clearance.

c. Check wheel cylinders, repair or replace as necessary.

37. BRAKE PEDAL FAILS TO RETURN

a. Check pedal return spring, adjust or replace as necessary.

b. Check master cylinder, tighten loose mounting bolts.

c. Check brake pedal mounting bracket, adjust bracket and tighten bolts.

Section IV
CLUTCH

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Clutch Housing Alignment	76
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DATA AND SPECIFICATIONS

Models	C-75,1-2
MODEL	1417 (Borg-Beck)
TYPE	Single Plate, Dry Disc
FACINGS	Two
Material	Molded Woven Asbestos
Inside Diameter	6 inches.
Outside Diameter	10 inches
Thickness	⅛ inch
Total Effective Area (Sq. In.)	100.5
Engagement Cushioning Method	Springs, Flat, Crimped
Torsional Damping	Coil Spring
Release Bearing	Ball (Sealed)
PRESSURE SPRINGS	12
Total Plate Pressure (Lbs.)	2013
Individual Pressure (Lbs.)	195/6# @ 1.50 inches
PEDAL FREE PLAY	1 inch
CRANKSHAFT FLANGE DIAMETER RUNOUT	.002 inch

SPECIAL TOOLS

Tool Number	Tool Name
C-3005	Wrench—100 Foot-Pound Sensory Type Torque
C-3044	Wrench—Clutch Fork Pivot Lock Installing
C-3181	Installer and Burnisher—Clutch Shaft Pilot Bushing
C-3185	Remover—Clutch Shaft Pilot Bushing

SPECIAL TOOLS (Cont'd)

C-360	Arbor—Clutch Shaft Aligning
C-585-A (with Spacer No. 45)	Fixture—Clutch Rebuilding and Adjusting
C-647	Tester—Clutch Spring
C-860	Reamer—Clutch Housing Oversize Dowel
C-869	Set—Dial Indicator
C-870	Bar—Clutch Housing Alignment Checking

TIGHTENING REFERENCE

Part Name	Foot-Pounds
Rear Engine Support Bolts	85
Clutch Cover Bolts	20
Transmission to Clutch Housing Bolts	50
Housing to Cylinder Block Bolts	50
Flywheel Stud Nuts	60

Section IV

CLUTCH

1. CLUTCH PEDAL ADJUSTMENT (FREE PLAY)

Clutch pedal free play is movement of clutch pedal before the release bearing contacts the clutch fingers. To compensate for normal clutch wear, adjust the clutch release fork rod, as shown in Figure 1, to obtain $\frac{5}{32}$ inch free play of clutch release fork outer end. This will provide a one inch free pedal movement at the pedal, with a total of six inch pedal travel.

2. OVER-CENTER SPRING ADJUSTMENT (FIG. 1)

Remove spring washer that holds clutch pedal release rod to the clutch pedal and back off the over-center spring adjusting nut until it is free of the "C" link.

With the clutch pedal depressed to the full six inch travel, turn the adjusting nut until the nut just contacts the "C" link. Tighten seven full turns from the finger tight position.

Install the clutch pedal release rod and secure in position with the spring washer. This adjustment should give a maximum pedal effort of 32-35 pounds and a minimum pedal return effort (at one inch from full pedal return) of 3-6 pounds.

3. CLUTCH RELEASE FORK (FIG. 1)

a. Removal

Unhook the clutch release fork pull-back spring (Fig. 1). Disconnect the rear end of the clutch release fork rod from the fork by removing the retaining spring and flat washer. Lift out the clevis pin and separate the clutch release fork rod from fork.

Remove the dust seal. Pivot the clutch fork outer end toward front of engine. Apply pressure, and disengage the clutch fork spring clip

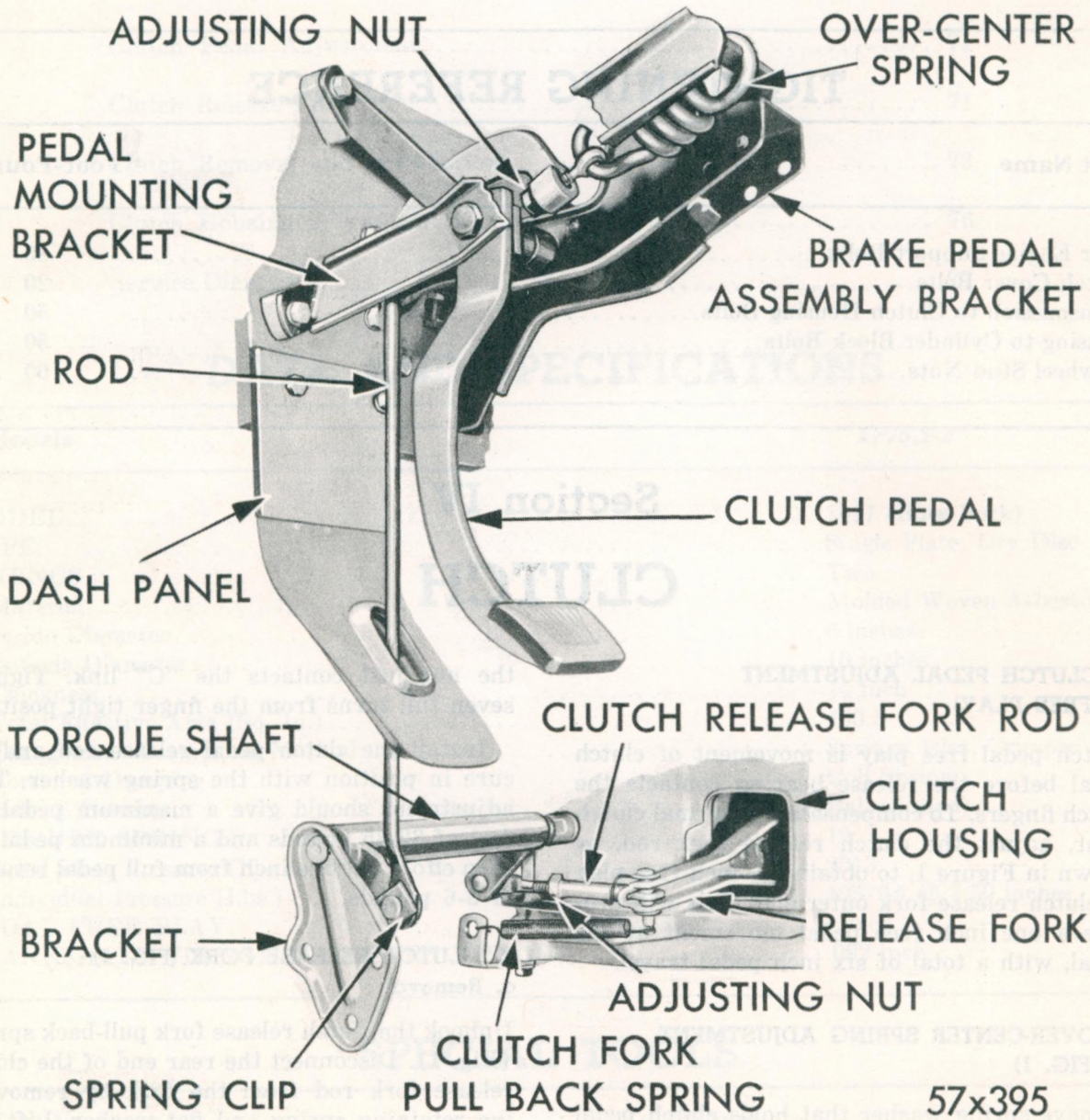


Fig. 1—Suspended Clutch Pedal and Linkage

from pivot ball. Slide the fork forward, disengage at the clutch throw-out bearing spring, and remove fork from clutch housing. The clutch fork pivot can be removed after transmission has been removed.

b. Installation

NOTE: The clutch release fork can be installed with the clutch housing pan removed or in position. To insure proper positioning of the fork in the release bearing sleeve it is recommended that the pan be removed.

Slide the clutch release bearing forward and add MOPAR Lubriplate to the fork fingers and pivot indent.

NOTE: SLIDE the clutch fork into housing engaging the springs on the release bearing and allowing the release fork retaining spring to pass around pivot stud.

Slide dust seal over shank of clutch release fork and down against clutch release fork and down against clutch housing; forcing boot flange into housing opening to hold seal in position. Install clutch fork release rod, clevis pin and flat washer. Secure with spring retainer and attach release fork pull-back spring.

4. CLUTCH TORQUE SHAFT AND PIVOT BUSHINGS (FIG. 1)

a. Removal

Unhook the clutch release fork pull-back spring from clutch housing and fork. Disconnect the clutch release fork rod. Remove spring washer and disconnect the clutch pedal release rod from the torque shaft lever pin.

Remove the snap ring that retains the pivot, bracket and bearings to the torque shaft. Remove engine side torque shaft stud allowing it to enter into the torque shaft tube, swing torque shaft down and pull it away from the frame side ball stud.

b. Installation

After cleaning all parts thoroughly and inspecting for wear, lubricate the pivots and pivot bearings with chassis lubricant. Install pivot bearings over the pivot ball at frame and slide end of torque shaft over the bearings and down into position. Place the two remaining bearings on the clutch housing pivot ball and slide the bearings and pivot into the free end of the torque shaft. Screw stud into the clutch housing. Install the snap ring.

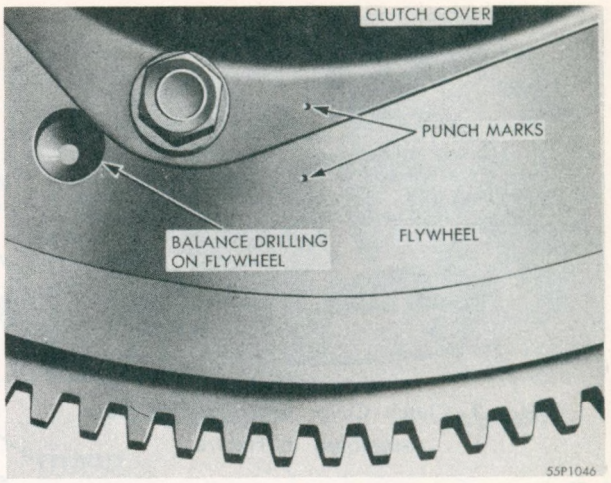


Fig. 2—Punch Marks on Clutch Cover and Flywheel

Attach clutch pedal release rod to torque shaft lever pin and install spring washers. Attach clutch release fork rod to torque shaft, install spring washer, and hook up the clutch release fork pull-back spring. Check clutch pedal for free play. (Refer to Paragraph 1).

5. CLUTCH REMOVAL

Remove the transmission and the clutch housing pan. Remove the clutch release bearing by pivoting and sliding the bearing assembly off the fork.

CAUTION

Do not force the bearings and pull-back springs off of the fork prongs.

Punch mark the clutch cover and flywheel, as shown in Figure 2, for correct positioning at installation. Remove the clutch pressure plate and disc assemblies. Loosen each bolt only a few turns at a time until the spring tension is relieved; otherwise, the clutch cover may become warped, resulting in clutch chatter.

6. CLUTCH DISASSEMBLY (FIG. 3)

Mount the clutch assembly in compressing fixture, Tool C-585-A. Mark the cover and pressure plate with a punch so that they may be reassembled in their original positions to maintain balance.

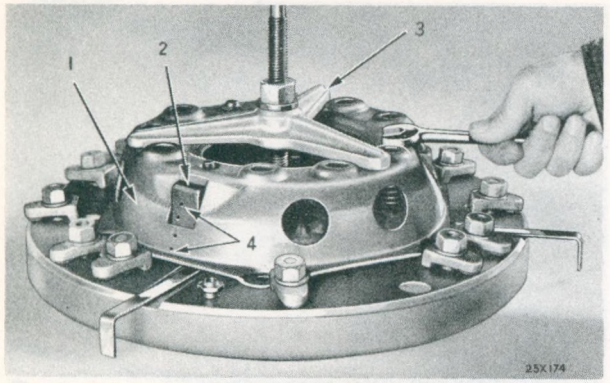


Fig. 3—Clutch Cover and Pressure Plate Assembled in Fixture

1—Clutch cover
2—Clutch pressure plate (showing lug)
3—Fixture (Tool C-585-A)
4—Punch marks on pressure plate and cover

With clutch assembly under pressure, remove the clutch release lever eyebolt nuts, and back off the compressor tool nut slowly until spring tension is relieved. Remove compressor nut and spider, and lift off clutch cover. Make a notation of spring arrangement to insure proper assembly. Hold the clutch release lever and eyebolt, as shown in Figure 4 and remove levers, struts and eyebolts.

7. INSPECTION

Clean all parts thoroughly and inspect them carefully for excessive wear or distortion. (Refer to Fig. 5).

a. Clutch Disc Assembly

Check for wear in the splines of the disc hub, loose rivets, or broken dampener springs.

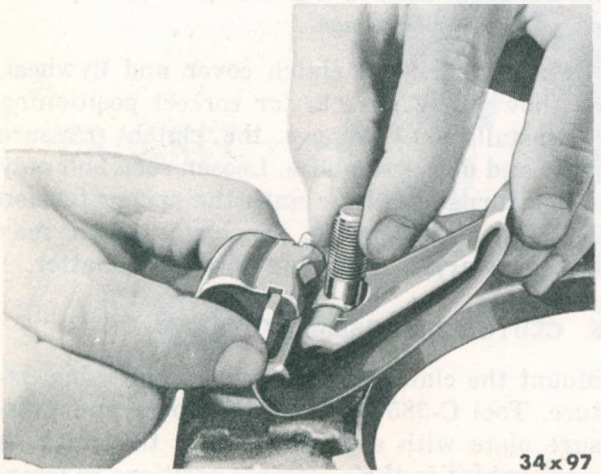


Fig. 4—Removing or Installing Clutch Release Lever

b. Pressure Plate

Check the pressure plate for signs of scoring, excessive wear or heat checking, also check for warpage. If it is warped more than .005 inch, install a new pressure plate. Inspect the pressure plate lugs for excessive wear at the fulcrum strut contacts.

c. Pressure Springs

Test pressure of springs using testing fixture Tool C-647. Individual spring pressure should be as recommended in Specifications.

d. Clutch Cover

Place clutch cover on a surface plate or on a new flywheel to check for damage or distortion.

e. Release Levers

Release levers that are badly worn on the release bearing contact face are an indication that the bearing is operating with insufficient free play and/or a damaged clutch release bearing. Replace eyebolts and adjusting nuts if threads are damaged. Replace struts if they are worn on contact edges.

f. Flywheel

Check flywheel to clutch disc contact and clutch cover to flywheel attaching surfaces for scoring or roughness. Check tightness of flywheel stud nuts. The tightening torque for these nuts is 60 foot-pounds.

g. Transmission Drive Pinion Pilot Bushing

Check the pilot bushing for looseness in the crankshaft bore and for scoring or excessive wear in the inside diameter of the bushing. To remove the bushing, screw the tapered pilot of Tool C-3185 into the bushing, allowing the pilot to cut its own threads until a solid grip is obtained. Insert the puller screw and turn clockwise to remove bushing.

To install the pilot bushing, slide a new bushing over the pilot of Tool C-3181 and drive the bushing into the crankshaft with a soft hammer. This will cause the bushing to tighten on the pilot. Install cup and puller nut of Tool C-3181. Tightening the puller nut will pull the tool from the bushing and, at the same time, burnish the bushing to exact size. Place one-half teaspoon of short fiber grease in radius at back of bushing.

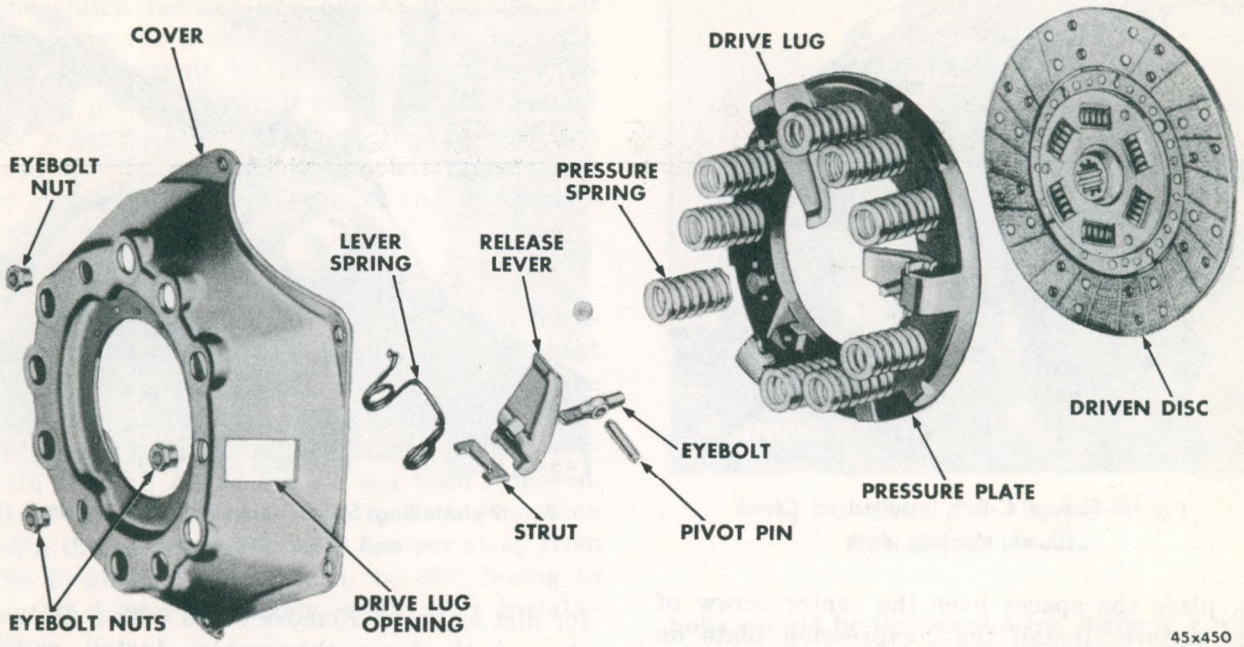


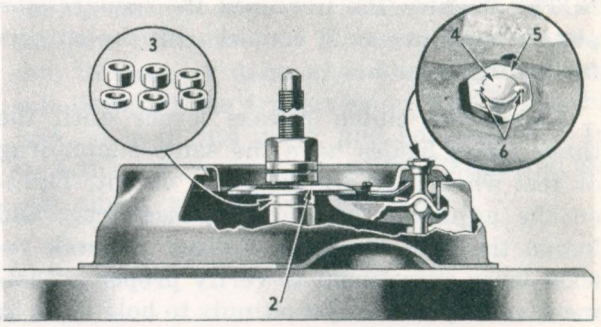
Fig. 5—Clutch Assembly (Disassembled View)

8. CLUTCH ASSEMBLY

Coat driving lug sides (Fig. 5) with a thin coating of MOPAR Lubriplate. Assemble the lever pin and eyebolt to the release lever. Hold end of lever and eyebolt in one hand, as close together as possible. Enter the lower end of the eyebolt in the pressure plate opening and, with the free hand, insert strut in the slot of the pressure plate lug. Assemble the other two levers in the same manner.

Install pressure plate springs over the small bosses on the pressure plate in the same order as removed to retain the original balance. Install clutch cover, lining up the punch marks. Also, make sure that the eyebolts and drive lugs are guided through the holes in the cover while compressing the assembly.

With the clutch compressed in fixture Tool C-585-,A screw the adjusting nuts on the protruding eyebolts until the nuts are flush with the tops of the eyebolts, as shown in Figure 6. Slowly release pressure by unscrewing the fixture compression nut. Depress the release levers several times (to properly seat the parts) by using fixture Tool C-585-A.



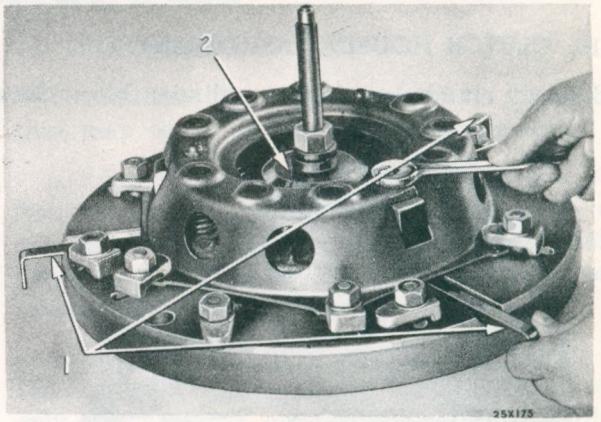


Fig. 6—Adjusting Clutch Release Levers

1—Feeler blades (part of Tool C-585-A)
2—Compression plate (part of Tool C-585-A)
3—Spacers (part of Tool C-585-A)
4—Clutch release lever eyebolt
5—Clutch release lever eyebolt nut
6—Stake here to lock

9. CLUTCH RELEASE LEVER ADJUSTMENT (FIG. 6)

With the pressure plate in fixture Tool C-585-

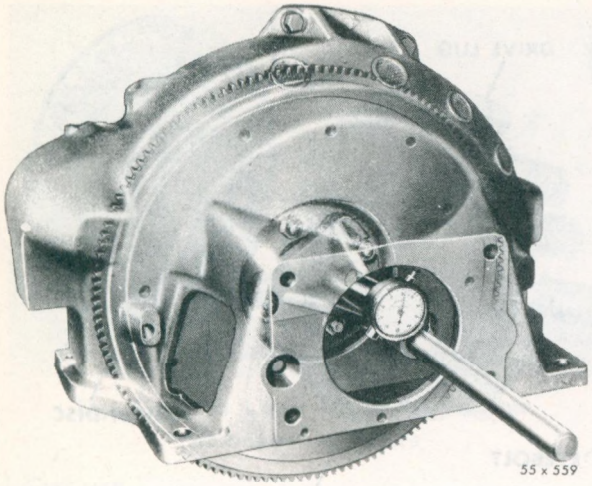


Fig. 7—Fixture C-869 Installed to Check Clutch Housing Bore

A, place the spacer over the center screw of the fixture. Install the compression plate on the center screw, resting it directly against the clutch release levers. Install the self-aligning washer, flat washer, and compression nut.

NOTE: Tighten the nut until the compression plate comes into snug contact with the spacers for setting lever height.

Adjust the clutch release levers until the three feeler blades have the same slight drag or feel when they are moved in or out. Tighten the adjusting nuts to decrease drag, and loosen the nuts to increase drag. Recheck release lever adjustment to verify proper adjustment and stake the eyebolt nuts to hold them in position. Remove clutch from fixture.

10. CLUTCH HOUSING ALIGNMENT

Inspect clutch housing to cylinder block face

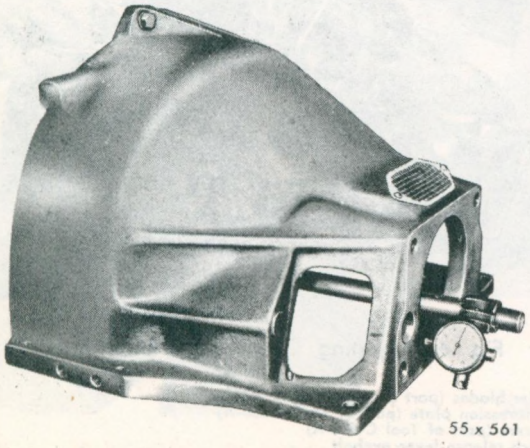


Fig. 8—Checking Rear Face of Clutch Housing

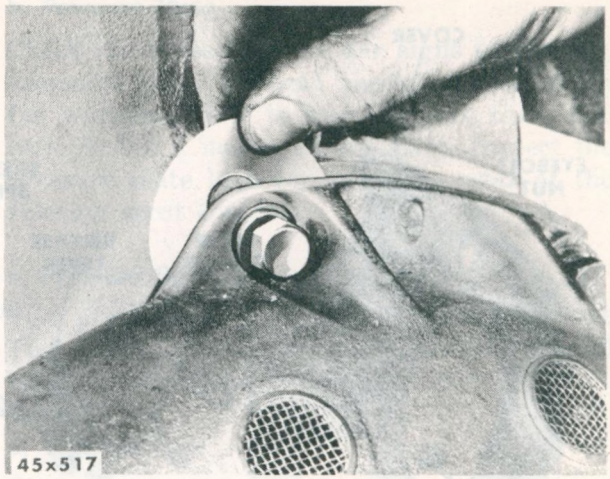


Fig. 9—Installing Shims between Cylinder Block and Clutch Housing

for dirt or burrs. Remove burrs with a file and clean both faces thoroughly. Install clutch housing and tighten attaching bolts just snug enough so that the housing can be shifted by tapping with a mallet.

Install arbor Tool C-870 to the flywheel attaching studs, as shown in Figure 1. Install indicator Tool C-869 so that the point of the indicator contacts bore of housing. The bore of the clutch housing should not vary more than .005 inch. Check the rear face of the housing, as shown in Figure 8. The tolerance must be within .003 inch. Rear face misalignment can be corrected by placing shims of proper thickness between the clutch housing and cylinder block, as shown in Figure 9. If alignment is necessary, remove the dowel pins and tap the housing until it comes within the specified tolerance. Ream new dowel pin holes with Tool C-860 and install oversize dowels. Tighten the housing bolts 50 foot-pounds torque. Failure to align clutch housing may result in hard shifting and jumping out of gear.

11. PRECAUTIONS TO FOLLOW WHEN STEAM CLEANING ENGINE

CAUTION

Immediately after the steam cleaning operation, start the engine and slip the clutch to dry off the disc assembly, pressure plate, and/or flywheel.

Since the clutch housing is ventilated, steam vapor condenses and moisture settles on the internal moving parts of the clutch mechanism.

The clutch facings will absorb moisture and under the force exerted by the pressure plate, the facings will be bonded to the flywheel and/or pressure plate, if car is allowed to stand for some time before using. If this condition occurs, it will necessitate complete replacement of clutch disc, pressure plate, and flywheel.

12. CLUTCH INSTALLATION

Coat the transmission drive pinion pilot bushing (in end of crankshaft) with medium short fiber grease. (Place one-half teaspoon of grease in radius at back of bushing). Clean the flywheel and pressure plate surfaces, making certain that all oil or grease has been removed. Hold the clutch disc in the mounting position with the springs on the disc damper away from the flywheel. Do not touch the disc facing as clutch chatter will likely result after installation.

Insert the clutch disc aligning arbor, Tool C-360 through the disc hub and into the pilot bushing, as shown in Figure 10. Install clutch pressure plate over aligning arbor and into position on the flywheel, aligning the punch marks. Insert cover attaching bolts but do not tighten.

CAUTION

To avoid clutch pressure plate distortion, the bolts should be tightened a few turns at a time, alternately, until they are all tight.

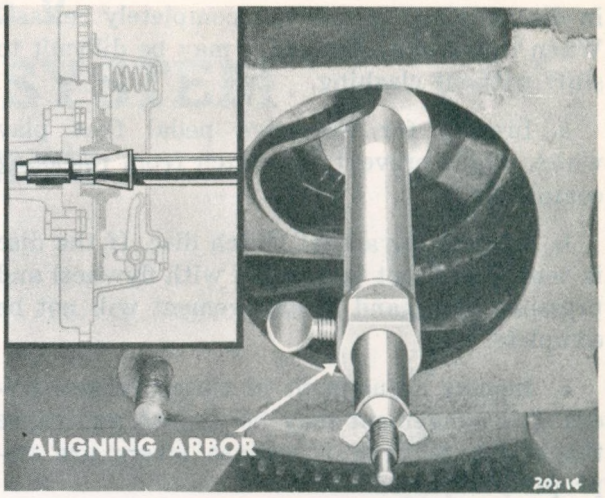


Fig. 10—Clutch Disc Aligning Arbor (Tool C-360) Installed

Tighten the bolts 15 to 20 foot-pounds torque. Remove aligning arbor, Tool C-360. Install clutch release bearing and collar, carefully engaging springs over the clutch fork fingers. Install the transmission. Do not allow transmission to hang or damage to the clutch will result. Support the transmission with a suitable jack, slide it into place, and bolt securely. Install the clutch housing cover. Check and adjust clutch pedal free play.

SERVICE DIAGNOSIS

13. SLIPPING CLUTCH

To test for a slipping clutch, start the engine, set the hand brake and shift into high gear. Release the clutch pedal and accelerate the engine slowly. The engine should stall immediately if the clutch is not slipping.

a. Inspect for insufficient pedal free play, which may prevent the clutch from engaging completely.

b. Inspect for burned, worn or oil soaked clutch disc facings.

c. Inspect for weak or broken pressure plate springs. Test each spring for weakness. If the paint on a spring is burnt or coils are too close together, the spring is probably weak.

14. CHATTERING CLUTCH

This condition can be determined by vibration that may occur during clutch engagement.

a. Inspect for oil or grease on facings. Before replacing disc, determine the source of the leak. Oil may come from a leaky rear main bearing, the transmission or from use of excessive lubricant in the pilot bushing.

b. Inspect for a cocked pressure plate. If the clutch release levers are not adjusted properly, the pressure plate will not meet the disc evenly.

15. DRAGGING CLUTCH

This condition exists when the clutch is slow

in disengaging, or will not completely release. When this occurs, the gears may be difficult to shift without clashing.

a. Inspect for excessive pedal free play which might prevent the clutch from releasing completely.

b. Inspect for a bent clutch disc. If the disc is bent, it will not be parallel with flywheel and pressure plate, and disengagement will not be complete.

c. Inspect adjustment of clutch release levers. Disengagement may be uneven and cause the clutch to drag if release levers are improperly adjusted.

d. Make sure clutch disc hub does not bind on the drive pinion shaft. If it does bind, a dragging condition may be created.

16. PEDAL STIFF OR BINDING

a. Inspect clutch linkage for rust or corrosion. Inspect for bent or misaligned linkage or a bent torque shaft arm.

b. Check adjustment of free play and overcenter spring if clutch pedal is hard to operate, or the pedal will not return properly.

17. NOISES

a. A high-pitched or grinding noise, occurring only with the engine running, the transmission in NEUTRAL, and the clutch pedal down, usually indicates that the release bearing should be replaced.

b. A rattling noise may develop when an uneven lever causes the release bearing to shuffle on its sleeve.

c. A high-pitched noise, occurring only with the engine running, the transmission in GEAR, and the clutch pedal down, may indicate that the pilot bushing is tight, worn or dry. The noise is usually more evident in low or second gear than it is in high gear, while coasting.

d. If a metallic rattle or buzz is heard, it may be caused by improper functioning of the clutch damper unit and the disc should be replaced. This noise is usually evident when the car is accelerated from 18 to 30 mph or when coasting in gear with clutch engaged from 50 to 35 mph. This noise may appear at lower speeds if the transmission is in 1st or 2nd gear.

e. If a rapping noise is heard when the engine is accelerated and the clutch disengaged (pedal down) it may be due to excessive clearance between the pressure plate lugs and the openings in the stamped cover.

f. If a squeaky noise is heard while the clutch pedal is being operated, it may be due to the pressure plate release levers, or the drive lugs rubbing on the cover. Work Lubriplate between the clutch cover and the drive lugs, using feeler stock.

Section V
COOLING SYSTEM
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DATA AND SPECIFICATIONS

MODELS	C-75	C-76, IM-1-2-4
COOLING		
Type	Pressure Vent	
Capacity:		
With Heater	22 qts.	25 qts.
Without Heater	21 qts.	24 qts.
Radiator Cap Relief:		
Valve Pressure—psi	14	
With Air Conditioning	14	
WATER PUMP		
Type	Centrifugal	
Bearing Type	Ball Bearing	
THERMOSTAT		
Type	Choke	
Starts to Open (up to)	158° to 162° F.	(Air Cond. 177° to 182° F.)
Fully Open	185° F.	(Air Cond. 202° F.)
FAN BELT		
Number Used (Standard Steering)	one	
(Power Steering)	two	
Type	V	
Tension	½ in. Slack	

DATA AND SPECIFICATIONS (Cont'd)

MODELS	C-75*	C-76, IM-1-2-4
FAN		
Number of Blades	six	
Diameter	18 in.	
RADIATOR-TO-BLADE		
Clearance	Top—¾ in. Bottom—¾ in.	
RADIATOR		
Type	Cellular Tubular or Fin and Tube	
Thickness (Standard)	1⅞ inch Cellular Tubular	2¼ inch Cellular Tubular
	2 inches Fin and Tube	2½ inch Fin and Tube
(With Air Conditioning)	2¼ inch Cellular Tubular	2½ inch Cellular Tubular

*All Models with Air Conditioning have a box type fan shroud, six blade fan.

SPECIAL TOOLS

Tool Number	
C-311	Flushing Gun
C-3208	Remover—Water Pump Shaft Bushing
C-3476	Puller—Plastic Water Pump Impeller Insert
C-3468	Sleeve—Water Pump Bearing and Shaft Installing
C-551	Refacer—Water Pump Housing Seat

TIGHTENING REFERENCES

	(Foot-Pounds)
Water Pump Body to Housing	30
Water Pump Body Bolt	30
Water Pump Inlet Elbow Bolt	30

Section V

COOLING SYSTEM

The cooling system incorporates a fin and tube type, full flow radiator and a centrifugal water pump. On cars equipped with Air Conditioning—Heater Unit, the engine cooling system has an 180° F. thermostat, 14 pound radiator pressure cap and sufficient permanent type anti-freeze to insure the engine coolant 20° F. in the summer time, and more permanent type anti-freeze in the winter according to the atmospheric temperatures. **The 180° F. thermostat and the 14 pound radiator pressure cap is for year around operation and sufficient permanent type anti-freeze to insure the engine coolant to 20° F. is required for the summer time.**

1. FLUID FAN DRIVE (FIG. 1.)

(All Models with Air Conditioning)

The fluid fan drive consists of a rotor driven by the shaft which is secured to the water pump flange. The rotor is enclosed by the housing to which the fan is bolted. This housing is mounted on the shaft through two single row, sealed-for-life, ball bearings.

A nominal clearance space is maintained between the housing and rotor. The rotor is free to float along the axis of the shaft and anti-friction material has been applied to its faces in case of contact of these faces and the housing. The housing is partially filled with a special, heavy fluid and the drag of the fluid between the housing and rotor provides the driving force rotating the fan.

The power required to rotate the fan increases very rapidly with speed. The fluid fan drive has been designed to provide the necessary driving force to maintain cooling at low speeds and to limit the top speed of the fan at higher engine speeds, thus making more power available to the wheels and eliminating the fan noise encountered at higher engine speeds.

a. Engine Overheating

If the fan drive operates below its minimum design speed, excessive engine heating may occur. Check as follows: (1) The water pump to engine speed ratio is 1.1 to 1. The drive characteristics are such that a 1 to 1 ratio between the crank pulley and the fan should be obtained at an engine speed of 1400 R.P.M. or above. This can be checked with a timing light. The speed of the fan and crank shaft pulley is the same when both components are stopped by the timing light. If both components are stopped by the timing light at 1400 Engine R.P.M. or at a higher engine speed, the drive is satisfactory. If, however, the engine speed at which this occurs is less than 1400 R.P.M. the drive is operating at below minimum speed and must be replaced with a new unit. **Do Not Remove Filler Plug or Add Fluid to Drive Unit.**

b. Excessive Fan Noise

Should the drive lock-up, excessive fan noise will result. This may occur if a bearing fails or if drive is binding internally. On a properly functioning unit the fan can be rotated relative to the water pump pulley with only light finger pressure. When rotating the fan by hand there will be a marked decrease in the effort to rotate it after the blade has been turned through several complete revolutions. If there is excessive fan noise, and if the drive cannot be rotated relative to the pump pulley, it is defective and must be replaced.

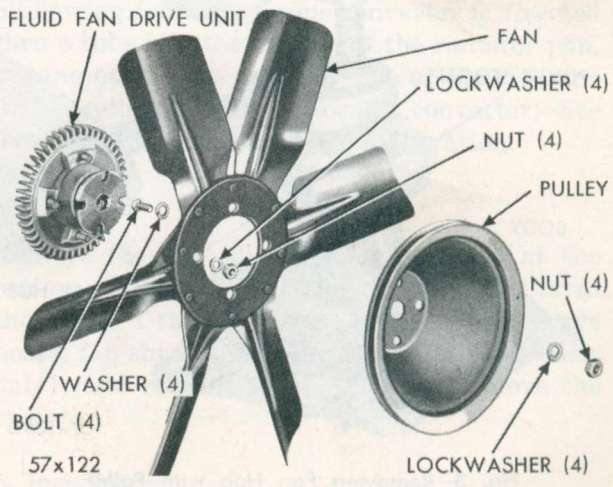

Fig. 1—Fluid Fan Drive (Exploded View)

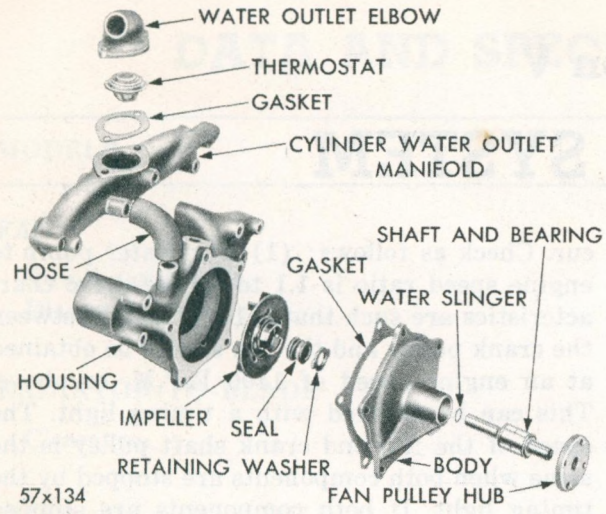

Fig. 2—Water Pump Assembly (Exploded View)

2. WATER PUMP

a. Removal from Car (See Fig. 2).

Drain cooling system and remove upper half of fan shroud (Air Conditioning Models only). Loosen the power steering pump or idler pulley, generator, and remove all belts. Remove fan, spacer and pulley. On Air Conditioning Models, remove the pulley from water pump fan hub, loosen all nuts from fan to remove the fluid fan drive, as shown in Figure 1. Remove bolts holding water pump body to housing and remove water pump.

b. Disassembly

Remove fan hub from shaft with puller Tool C-3208, (Fig. 3). Support pump body on hub

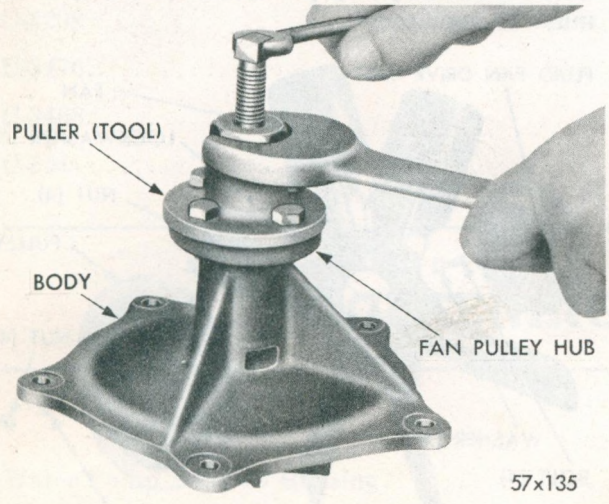

Fig. 3—Removing Fan Hub with Puller using Tool C-3208

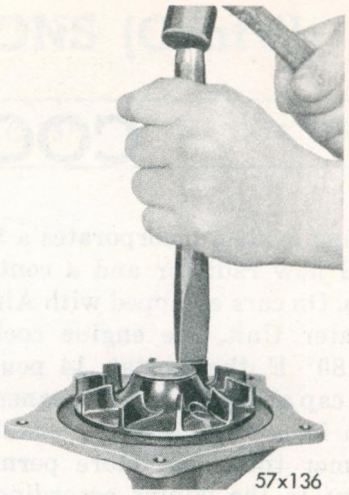

Fig. 4—Removing Plastic Impeller

end and remove impeller by breaking the plastic away from metal insert, as shown in Figure 4. Remove impeller metal insert using Tool C-3476.

NOTE: Shaft and bearing assembly do not have to be removed to service a leaking pump.

Support body on fan hub end and press out shaft and bearing assembly.

CAUTION

Shaft and bearing assembly can be removed only in the direction described. If an attempt is made to remove shaft in opposite direction, damage to water pump body will result.

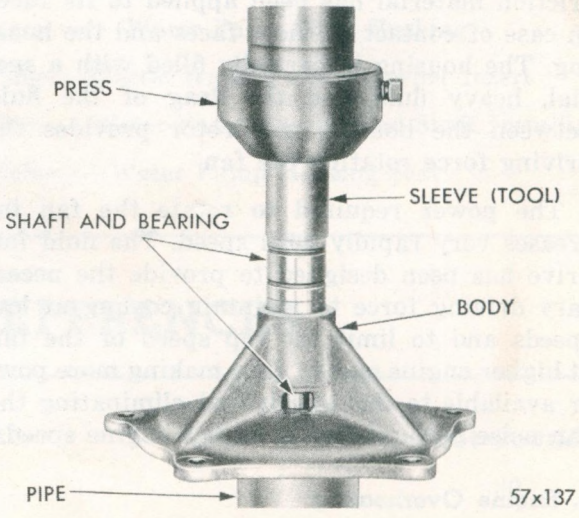

Fig. 5—Installing Shaft and Bearing Assembly (Tool C-3468)

NOTE: Bearing assemblies removed from water pumps for any reason should not be used again because damage to bearings usually results during removal.

Clean parts thoroughly. Inspect condition of seal seat and recondition using refacing Tool C-551.

c. Assembly (Fig. 1)

Support pump body as close to center bore as possible in an arbor press. **DO NOT SUPPORT BODY ON ATTACHING FACE, OR ON SEAL SEAT.** Press shaft and bearing assembly into body, using Tool C-3468, as shown in Figure 5.

NOTE: The .090 inch dimension must be maintained when installing new shaft and bearing assembly, as shown in Figure 6.

CAUTION

When pressing on impeller, support the pump body so that pressure is applied to the shaft and not to the pump body. If pressure is applied to pump body, damage to bearings will result. Press impeller on evenly to prevent breakage.

Install fan hub while supporting pump body on impeller and on shaft, as this will apply

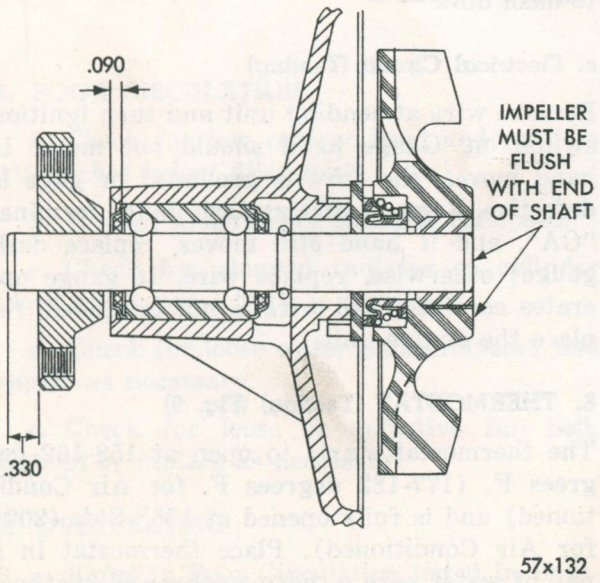

Fig. 6—Schematic Drawing (Water Pump)

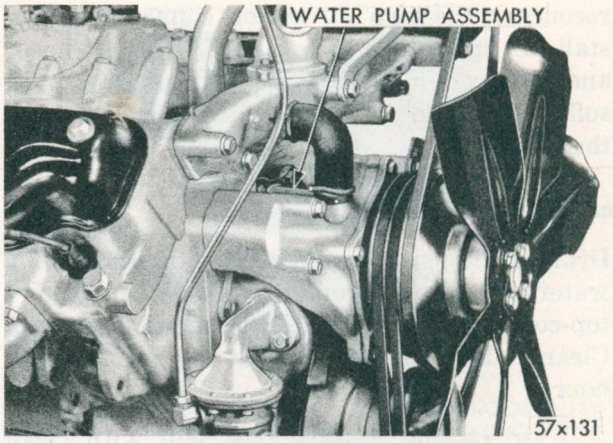

Fig. 7—Water Pump Installed (SpitFire Engine)

pressure to the end of shaft, and not to the body. Maintain .330 inch dimension, as shown in Figure 6.

d. Installation on Car (Fig. 7)

Install water pump body on housing, using new gasket. Tighten bolts to 30 foot-pounds torque. Install pulley, spacer and fan. (On Air Conditioning Models, assemble the fan to the fluid fan drive and pulley, and attach the assembly to the water pump. Tighten nuts to 15 foot-pounds torque. Install the upper half of fan shroud, run the engine, and check for leaks.

3. RADIATOR

The Torque Converter oil cooler is now located in the bottom of the pan in the radiator tank, which is an integral part of the radiator. The bottom of the radiator tank therefore, acts in the capacity of a heat exchanger in that the oil flowing from the torque converter is directed thru a tube into the bottom of the radiator pan, coming out on the opposite side of the radiator to be returned to the torque converter. See Transmission Section XI, for operation.

a. Removal

Remove the two oil cooler connections at the bottom of the radiator and drain the oil from the tank. Drain the cooling system, remove hoses, fan shroud (On Air Conditioning Models only), and radiator support bolts. Remove the radiator.

b. Installation

Attach radiator to radiator support bolts and

reconnect the two oil cooler connections. Install fan shroud (if so equipped) connect hoses and refill cooling system. Check for leaks. Add sufficient oil to the torque converter to refill the system.

c. Cleaning Radiator

Drain cooling system and refill with clean SOFT water and add the contents of one can (No. 1 top-compartment) of MOPAR Cooling System Cleaner. Run engine at a fast idle for ½ to ¾ hour.

Drain cooling system and refill with clean water. Pour conditioner (No. 2 bottom-compartment) into radiator and run engine for ten minutes. Flush entire cooling system until water runs clean. Refill radiator with clean SOFT water. Use MOPAR Radiator Rust Inhibitor during the summer months.

4. REVERSE FLUSHING

Reverse flushing of the cooling system is the forcing of water through the cooling system, using air pressure, in a direction opposite to that of the normal flow of water.

a. Cylinder Block

Drain radiator and remove hoses at radiator. Remove thermostat and reinstall thermostat housing. Install flushing gun Tool C-311, or other suitable flushing gun to the inlet hose. Connect water hose of gun to a pressure water source and the air hose of gun to a pressure air source. Turn on water, and when cylinder block is filled, turn on the air in short blasts. Allow cylinder block to fill between the blasts of air. Continue this procedure until water runs clean. Check thermostat and if satisfactory, reinstall; otherwise, replace. Use a new thermostat housing gasket. Refill cooling system.

b. Radiator

Drain cooling system and remove hoses from engine. Install flushing gun Tool C-311, or other suitable flushing gun in radiator outlet house. Fill radiator and turn on air in short blasts.

NOTE: Do not apply excessive pressure when pressure flushing radiator, as damage to radiator may result.

Continue this procedure until water runs clean. Refill cooling system. Run engine and check for leaks.

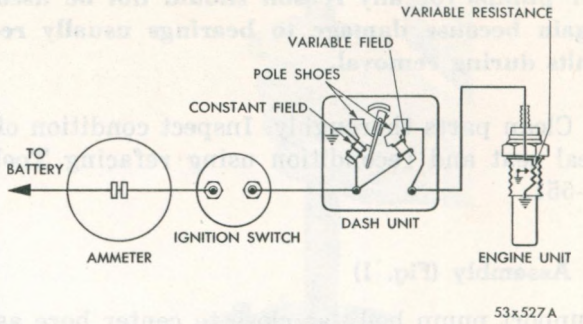

Fig. 8—Water Temperature Gauge

5. WATER TEMPERATURE GAUGE (Fig. 8)

a. Dash Unit

Consists of two electro-magnets, one connected to the ignition switch and ground, and the other electro-magnet between the ignition switch and a variable resistance to ground sending unit in the engine water. The temperature of the water varies the current in the one electro-magnet which pulls against the pointer (and other magnet) away from (C) cold position.

b. Sending Unit

The sending unit is located in the water outlet manifold and transmits the water temperature to dash unit.

c. Electrical Circuit (Testing)

Remove wire at sending unit and turn ignition switch on. Gauge hand should not move. If hand moves, the wire is grounded or gage is defective. Remove wire at dash gauge terminal "GA", and if hand still moves, replace dash gauge; otherwise, replace wire. If gauge operates correctly and wire is not grounded, replace the engine unit.

6. THERMOSTAT (Testing) (Fig. 9)

The thermostat starts to open at 158-162 degrees F. (177-182 degrees F. for Air Conditioned) and is fully opened at 185° Std. (202° for Air Conditioned). Place thermostat in a pail of water with a thermometer and heat water until thermostat starts to open. Check

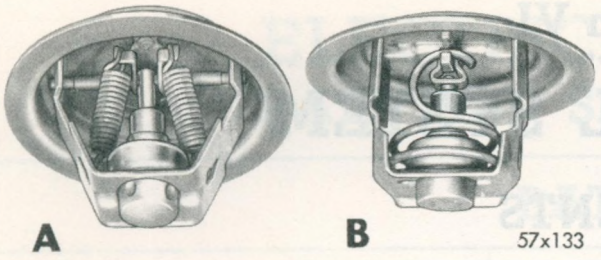

Fig. 9—Thermostat Assembly

thermometer and continue heating until thermostat is wide open, and again check thermometer. Replace thermostats that do not open completely, open at too low temperature or open at too high temperature.

7. RADIATOR PRESSURE CAP

Radiators are equipped with a 14 psi cap, as shown in Figure 10. Always check identification number on cap, when replacing.

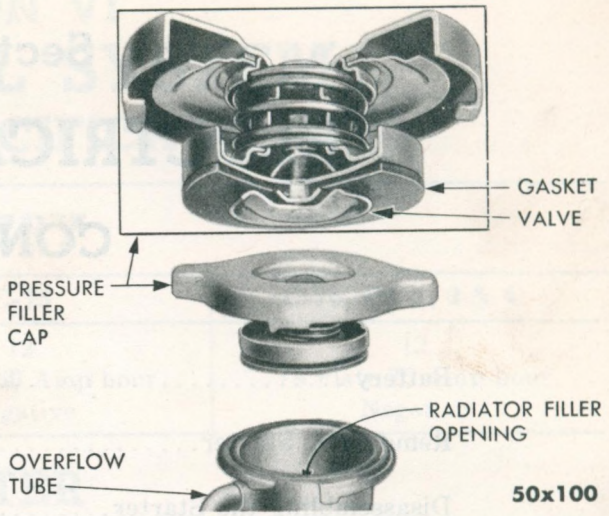

Fig. 10—Radiator Pressure Cap

WARNING

When removing pressure cap, turn it counterclockwise to the stop, permitting built up pressure to escape through overflow tube. This will prevent hot water from spraying out of radiator filler opening.

SERVICE DIAGNOSIS

8. POOR CIRCULATION

a. Check for low coolant level and refill to 1¼ inches below filler neck.

b. Inspect and replace hoses if collapsed.

c. Check for plugged radiator or cylinder block and reverse flush as necessary.

d. Check for loose water pump impeller and repair as necessary.

e. Check for loose or defective fan belt, tighten or replace as necessary.

9. OVERHEATING

a. Refer to Poor Circulation listed in Paragraph 11.

b. Check for plugged air passages of radiator coil and clean passages by applying air pressure on reverse side of radiator case.

c. Check for sticking thermostat and replace as necessary.

d. Check for excessive sludge in the crankcase. Drain and flush crankcase as necssary. In severe cases, remove oil pan and clean inside of block by hand.

10. OVERCOOLING

a. Check temperature gauges and replace as necessary.

b. Check operation of thermostat (could be sticking) in the open position.

Section VI

ELECTRICAL SYSTEM

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SECTION VI
ELECTRICAL SYSTEM
DATA AND SPECIFICATIONS

BATTERY

	C-75	C-76, IM-1, 2 & 4
Voltage	12	12
Capacity	66 Plate 60 Amp hour	78 Plate 70 Amp hour
Terminal Ground	Negative	Negative

STARTER

	C-75	C-76, IM-1, 2 & 4
Model	MDL 6001	MDL 6002 Up to 13,000 Jobs MDL 6001 After
Voltage	12-Volts	
Field Coils	4	4
Poles	4	4
Drive	Solenoid Shift Over-running Clutch	
Brush Spring Tension (New Brushes)	32 to 48 ozs.	
End Play	.005″ to .030″	
Free Running Test	3400 Min. RPM—85 Amps at 11.0 Volts	
Stall Torque Test	6.0 Min. Ft. Lbs.—225 Amps at 4 Volts	
Solenoid Switch:		
Pull-in Coil Draw	28.6 to 32.9 Amps at 6-Volts	
Hold-in Coil Draw	10.2 to 11.8 Amps at 6-Volts	
Pinion Adjustment (Clearance Between Pinion and Stop) with armature end play removed	$\frac{3}{32}'' + \frac{1}{32}'' - \frac{1}{64}''$	

ELECTRICAL LIGHT BULBS

	Number Required	Mazda Number	C.P. or Watts	Chrysler Part No.
Headlights (Seal Beams)	2	5400	50-40 W	1648133
Headlights (4) (Seal Beams) Inner High Beam Only	2	4001	37½ W	1753435
Headlights (4) (Seal Beams) Outer High and Low Beam	2	4002	50-37½ W	1753436
Headlight Beam Indicator Light	1	57	2	127934
Parking and Front Turn Signal	2	1034	32-4	151567
Rear Tail, Stop and Turn Signal Light	2	1034	32-4	151567
License Plate Light	2	67	3	142450
Glove Box Light	1	57	2	127934
Instrument Lights	4	57	2	127934
Map Light	Imperial 1; C-75, C-76—2	1004	15	151578
Turn Signal Indicator Light	2	57	2	127934
Dome Light	1 or 2	1004	15	151578

ELECTRICAL LIGHT BULBS (Cont'd)

	Number Required	Mazda Number	C.P. or Watts	Chrysler Part No.
Hand Brake Warning Light	1	90	6	142453
Back Up Light	2	1073	32	142456
Transmission Push Button Light	1	57	2	127934
Radio Dial Light	2	1891		
Clock Light	1	57	2	127934
Trunk Light	1	1003	15	151577

CIRCUIT PROTECTORS

Circuit	Type	Rated Capacity	Location
Lighting System	Circuit Breaker	20 AMP	Back of Headlight Switch
Clock	Internally Protected		
Windshield Wiper	Circuit Breaker	6 AMP	Back of Wiper Switch
Radio	Fuse	7½ SPE	In Radio Lead Wire
Window Lifts	Circuit Breaker	20 AMP—30 AMP Spl. 4 Dr. Sedan	Behind Left Front Kick Panel
Six Way Seat	Circuit Breaker	40 AMP	Behind Left Front Kick Pane

GENERATOR

Car Model	C-75	C-76, IM-1, 2 & 4
Gen. Model	(GJC-7002H; 1689328) Up to	(GHM-6001E; 1753625)
Standard	(GJC-7012A; 1770754) After	
With Air Conditioning	(GHM-6004C; 1704264)	(GHM-6004C; 1704264)
Rotation	Clockwise at Drive End	Clockwise at Drive End
Voltage	12	12
Output	Controlled by Vibrating Regulator	Controlled by Vibrating Regulator
Rated Current Output	30 Amperes	30 Amperes
Bearings		
Standard	Ball at drive end—Bushing at opposite end	Ball at drive end—Bushing at opposite end
With Air Conditioning	Ball—Both ends	Ball—Both ends
Ground Polarity	Negative	Negative
Poles	2	2
Brushes	2	2
Spring Tension	18 to 36 oz.	20 to 36 oz.
Field Coil Draw (Arm. to Field Term.)	1.2 to 1.3 amps at 10 volts	1.1 to 1.3 amps at 10 volts
Motorizing Draw	3.4 to 3.9 amps at 10 volts	2.3 to 2.6 amps at 10 volts
Test Bench Output Test (At 70° F)	20 amps, 14.3 volts at 1750 Max. RPM	6 amps, 13.6 volts, at 950 Max. RPM
	30 amps, 15 volts at 2250 RPM	30 amps, 15 volts at 1800 Max. RPM

REGULATOR

Car Model	C-75	C-76, IM-1, 2 & 4
Regulator Model	VRX-6201A—1642333	VRX-6201A—1642333
Ground Polarity	Negative	Negative
Resistors		
Marked 100		
Marked 60	55.0 to 70.0 ohms	55.0 to 70.0 ohms
Marked 38	34.5 to 42 ohms	34.5 to 42 ohms
Marked 30	28.0 to 34.5 ohms	28.0 to 34.5 ohms
Voltage Regulator		
Voltage Winding Resistance	43.7 to 49.3 ohms	

REGULATOR (Cont'd)

	C-75	C-76, IM-1, 2 & 4
*Armature Air Gap	.048 to .052 inch	
*Contacts are closed with high limit gauge installed and open with the low limit gauge installed. (Gauge on contact side and next to brass pin.)		
Voltage Setting (Operating Voltage after 15 minute run at 7 amperes)		

Temperature in degrees F	50°	60°	70°	80°	90°	100°	110°	120°
	14.42 to 15.05	14.36 to 14.94	14.30 to 14.90	14.23 to 14.83	14.16 to 14.76	14.09 to 14.69	14.2 to 14.9	13.94 to 14.54

Where difficulty is encountered in keeping battery charged, it is suggested that the upper voltage limit for a given temperature be used to set regulator.

Current Limiting Regulator	
*Armature Air Gap	.045 to .052 inch
	*Contacts are closed with high limit gauge installed and open with the low limit gauge in place. (Gauge installed on contact side and next to brass pin.)
Current Setting	Current Regulator Setting after 15 minute run at 7 amperes. Then followed with a 15 minute run at rated regulator setting (.2 to .4 volt below the voltage regulator setting.)

Temperature in degrees F	40°	60°	70°	80°	100°	40°	60°	70°	80°	100°
Current at Specific Temperature	31-35	29-33	28-32	27-31	25-29	41-45	39-43	38-42	37-41	35-39

Cut-Out Relay:	
Voltage Winding Resistance	107 to 121 ohms
Air Gap (Contacts Open)	
Measure Gap as near hinge as possible	.031 to .034 inch
Contact Gap (Minimum)	.015 inch
Contacts Close (Volts)	13.0 to 13.75 volts
Contacts Open (After a charge of 10 amperes.)	
Discharge Amperes	0 to 6 amperes discharge
Volts	8.2 to 9.3 volts

DISTRIBUTOR

Car Model	C-75	C-76, IM-1, 2 & 4
Timing Mark Location	Vibration Damper	Vibration Damper
Distributor Model		
Standard	IBP4002A; 1770750	IBK4304; 1689325
With Power Pack	IBP4002A; 1770750	IBK4304; 1689325
Contact Gap	.015 to .018 inch	.015 to .018 inch
Dwell	29° to 32°	(one set of points—29° to 32°) (both sets of points—36° to 39°)
Condenser Capacity	.25 to .285 mfd.	.25 to .285 mfd.
Breaker Arm Spring Tension	17 to 20 ounces	17 to 20 ounces
Drive	Camshaft	Camshaft
Side Play (shaft)	.005 inch max.	.005 inch max.
End Play (measured after assembly)	.003 to .010 inch	.003 to .010 inch
Firing Order	18436572	18436572
Timing	6° BTC	6° BTC
Timing Mark Location	Vibration Damper	Vibration Damper
Advance Curves	IBP4002A; 1770750	IBK4304; 1689325
Automatic (Distributor degrees and RPM)	0° at 350 to 450 0° to 2° at 450 5.5° to 7.5° at 750 12° to 14° at 2050	0° at 250 to 450 0° to 2° at 450 4° to 6° at 875 9° to 11° at 2250

DISTRIBUTOR (Cont'd)

	C-75	C-76, IM-1, 2 & 4
Vacuum (Distributor degrees and inches of vacuum	start at 10″ to 11″ 2° at 10.8″ to 11.8″ 6° at 12.6″ to 13.8″ 9.5° to 11.5° at 16″	start at 7.5″ to 8.75″ 2° at 8.75″ to 10.2″ 6° at 11.75″ to 13.4″ 10° to 12° at 18″

SPARK PLUGS AND COIL

Spark Plugs		
Type	AR-42	AGR-42
Size	14 mm.	14 mm.
Gap	.035 in.	.035 in.
Coil		
Model	CAH—4001 Chrysler Part No. (1688212)	
Output test should include resistor.		
Secondary resistance (ohms at 70° to 80° F.)	8000 to 9200	
Primary resistance (ohms at 70° to 80° F.)	1.65 to 1.79	
Ballast resistance (ohms at 70° to 80° F.)	.665 to .735	

HORNS

Make	Auto-Lite, Spartan, Jubilee
Current draw at 12.4 volts	9 to 10 amps

ELECTRIC WINDSHIELD WIPER

Variable Speed Motor	
Rated Volts	12
Resistor (ohms) (Variable speed wiper)	17-40
Field Current Draw at 13.5 volts	1½ to 2 amps
Motor Current Draw (with dry glass)	
High Speed	1½ amps at 66 to 75 rpm
Low Speed	3 amps at 35 to 40 rpm

POWER SEAT LIFTS

Type Motor	Series wound		
Rated Voltage	12		
Current Draw with Passenger Load	Pounds	Amps	Volts
Vertical Lift	500	50-60	10.5
	200	40-45	10.6
Horizontal Lift	600	60	10.4
	150	35	11.0

WINDOW LIFTS

Type Motor	Series wound
Rated Voltage	12
Maximum Stall Current	25 amps at 8.9 volts

Section VI
ELECTRICAL SYSTEM
BATTERIES

1. TESTING THE 12-VOLT BATTERY (FIG. 1)

NOTE: The battery cable terminals should be tight on battery posts to insure good contact. Battery posts and terminals that are corroded should be disconnected, terminals and clamp cleaned with a soda solution and a stiff brush. After cleaning, apply a thin coating of petrolatum.

a. Specific Gravity Test

Test specific gravity of battery with an accurate hydrometer. Where electrolyte level is too low to make a test, add battery water but do not attempt to test gravity until battery has been returned to service operation for at least four hours of normal driving.

The specific gravity of electrolyte will vary 4 points (.004) with every 10 degree F. change in temperature. Subtract 4 points (.004) for each 10 degrees below, and add .004 for each 10 degrees above 80 degrees F. Readings must be corrected to 80 degrees F. before interpreting as follows:

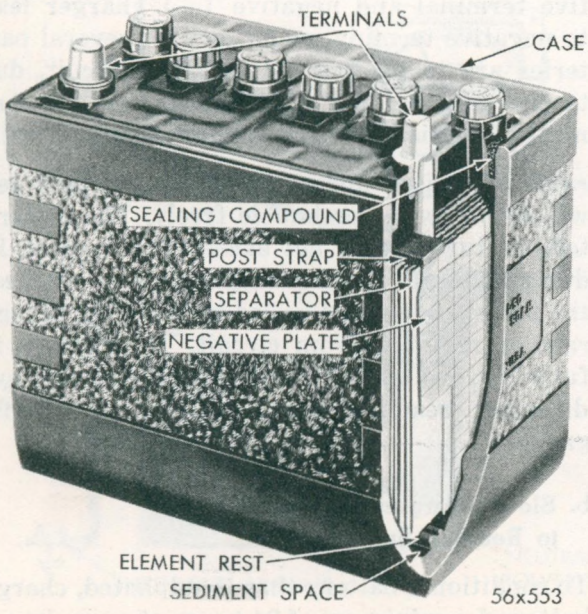


Fig. 1—Typical 12 Volt Battery (Cutaway View)

A fully-charged battery has a specific gravity reading of 1.255 to 1.275 (all batteries for use in temperate climates).

A battery that has a specific gravity reading of 1.225 or less, in cold temperature or 1.210 in warm temperature and all cells reading evenly within 15 specific gravity points (.015) of each other, requires recharging.

A battery that has a specific gravity reading which varies more than 15 points between any two cells should be recharged and high rate discharge tester or other suitable method used to check battery before discarding battery as unsuitable for use.

b. Voltage Tests

(1) Battery Cell Tester (Open-Circuit Voltmeter)

To make battery test, contact the meter prods (Tool MT-379) to proper cell terminals (red to positive, black to negative), using caution not to connect across more than one cell. The point of prod will have to be pushed through sealing compound to make contact with buried link for each cell reading.

NOTE: Freshly charged batteries have a "surface charge" which causes high and inaccurate readings unless properly dissipated. If battery is in vehicle, turn headlights on for one to three minutes to remove surface charge. Then turn lights off and wait several minutes before taking another reading.

The individual cell readings should not vary more than 0.05 volt between any two cells. A battery varying more than .05 volt between any two cells should be recharged and high rate discharge tester or other suitable method used to check battery before discarding battery as unsuitable for use.

(2) High Rate Discharge Test of Capacity (Fig. 2)

Satisfactory capacity tests can be made only

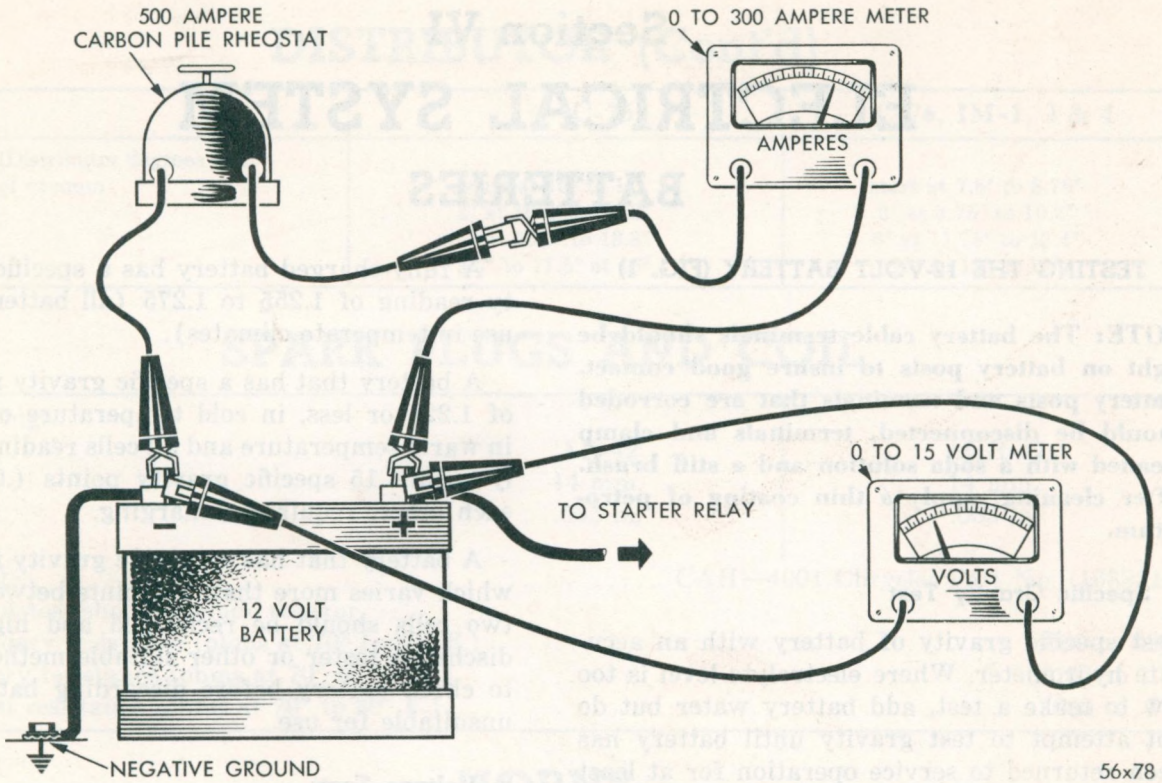


Fig. 2—Test Connections for Battery Capacity Test

when battery equals or exceeds 1.210 specific gravity at 80 degrees F.

Connect a carbon pile rheostat in series with an ammeter and battery, (Fig. 2). **Be sure the carbon pile control knob is rotated to full resistance position before connecting.** The voltmeter clips must contact battery posts **only** and not the high rate discharge tester clips. Unless this is done, the actual battery terminal voltage will not be indicated. Rotate carbon pile control knob until 200 amperes register on the meter. With battery under discharge for approximately 15 seconds, read terminal voltage. If terminal voltage shows 9.5 volts or more, battery has good output capacity.

2. CHARGING THE BATTERY

a. Slow Charging

NOTE: Slow charging is recommended wherever possible.

The slow chargers commonly used in service stations are suitable for charging both 6 and 12-volt batteries on the same circuit. Each 12-volt unit must be considered as equal to two 6-volt batteries, and charging rate must be adjusted to suit the smallest 12-volt battery on the line. Safe slow charging rates are determined by allowing one ampere per positive plate per cell. The proper slow charging rate for an 11 plate battery is five amperes.

Connect (positive +) charger lead to positive terminal and negative (—) charger lead to negative terminal of battery. If several batteries are to be charged in same circuit, due to charging voltage supply, batteries are connected in series for required number per circuit.

As batteries approach full charge, each cell will begin to gas or bubble freely. The battery temperature should not exceed 125 degrees F. during charge. If this temperature is reached, the battery should be cooled by reducing charge rate or removed from circuit. The battery is fully-charged when three successive hourly hydrometer readings show no rise in specific gravity.

b. Slow Charging Batteries to Remove Sulphation

To condition a battery that is sulphated, charge battery for minimum of 24 hours at a maximum charging rate of four (4) amperes. As battery

approaches full charge check specific gravity at hourly intervals. With no rise in specific gravity for three successive readings battery is charged to its peak capacity.

c. Fast Charging

Use **only** a 12-volt fast charger and adjust charging rates to maximum of 25 to 30 amperes for 60 or 70 ampere hour batteries.

CAUTION

Battery temperature should not exceed 125 degrees F. during charge. If charger is not equipped with thermostatic cut-off and battery has not received sufficient charging, turn charger off until battery has cooled to 100 degrees F. before starting high rate charge for continued charging.

d. Boosting Charge for Stock Batteries

Stock batteries should be boosted monthly or when specific gravity reaches 1.210 specific gravity corrected to 80 degrees F., or when open-circuit voltage drops to 2.05 volts per cell. **Battery should be fully-charged when installed.**

WARNING

When batteries are being charged an explosive gas mixture forms beneath cover of each cell. Do not smoke near batteries on charge or which have recently been charged. Do not break live circuits at terminals of batteries on charge. A spark will occur where the live circuit is broken. Keep all open flames away from battery.

STARTERS

The starter drive is engaged with flywheel by a solenoid mounted on starter. The relay is separated from solenoid and is mounted on left front fender splash shield. There is no cover band on starter, and brush arm supports are attached to starter frame.

3. TESTING STARTER RESISTANCE AND CURRENT DRAW

Test battery. If it tests 1.210 specific gravity or less, charge battery. Test circuit resistance and starter current draw at same time (Fig. 3).

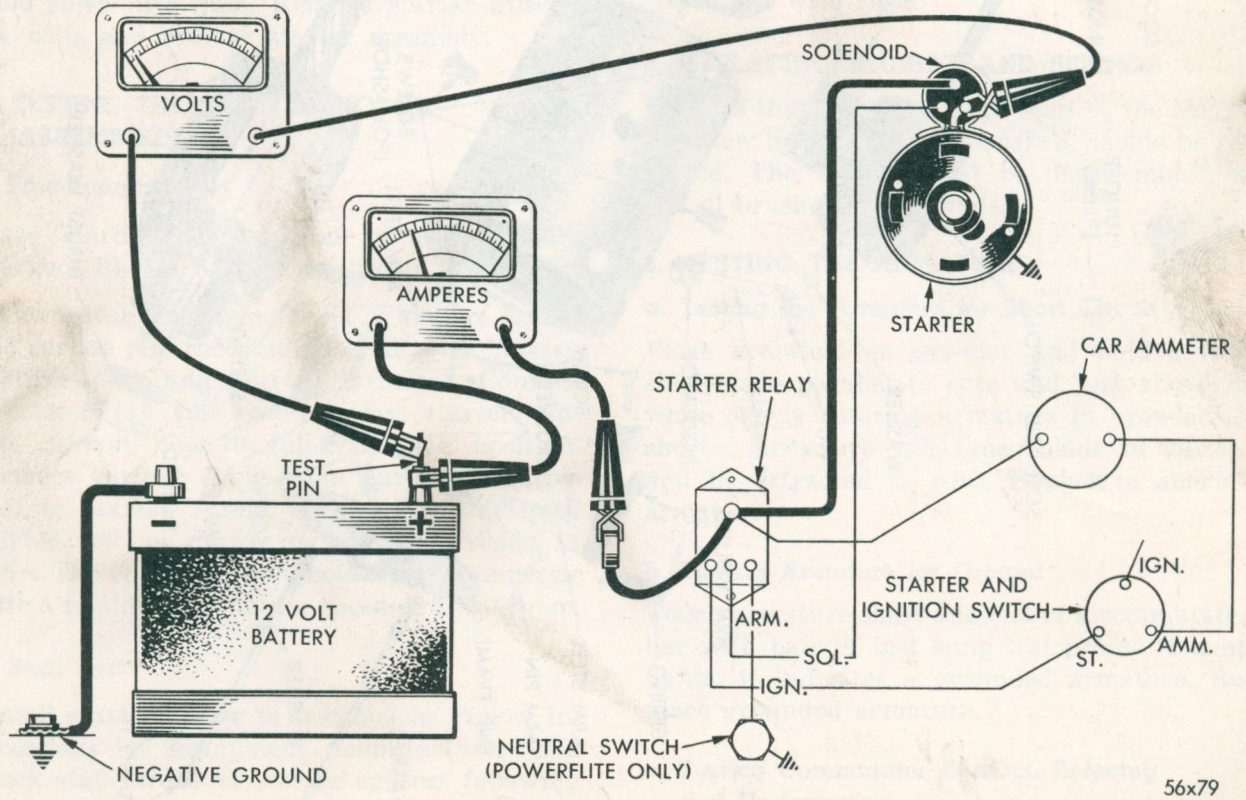


Fig. 3—Testing Starter Motor Circuit Resistance and Current Draw

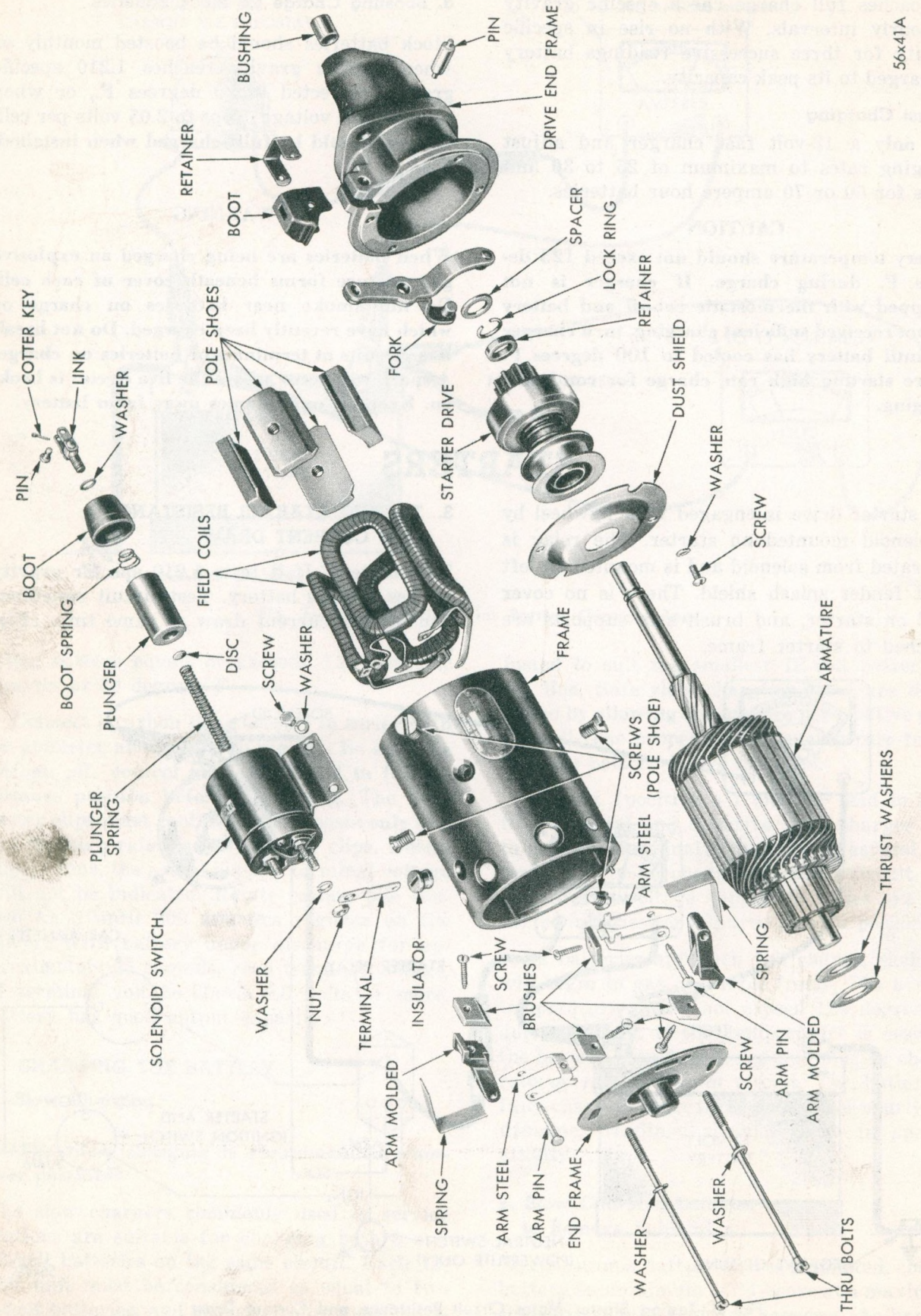


Fig. 4—12 Volt Starter Motor

Disconnect battery lead from positive battery terminal post. Connect 0 to 300 scale ammeter between disconnected lead and battery terminal post. Connect a test voltmeter with .10 volt scale divisions between the removed battery cable lug and solenoid switch motor terminal.

Crank engine and observe readings on voltmeter and ammeter. The voltage should not exceed .20 volt per 100 amperes of current. The current should not exceed 150 amperes (warm engine and battery). A reading of voltage that exceeds .20 volt per 100 amperes indicates there is high resistance caused from loose circuit connections, defective cable or burned switch contacts. A current that is high (150 amperes or more), and is combined with slow cranking speed, indicates that starter should be removed and repaired. A current that is low, with slow cranking speed, indicates resistance in solenoid switch or loose brush pigtail or soldered lead starter such as burned commutator and worn brushes.

4. REMOVAL OF STARTER

Disconnect battery cable from battery. Raise car and disconnect cable and solenoid lead wire from solenoid switch. Remove starter attaching bolts and remove starter assembly.

5. TESTING THE STARTER MOTOR (ASSEMBLED)

a. Free-Running Test

Place starter in vise and connect a fully charged, 12 volt battery to starter as follows:

Connect a test ammeter (100 ampere scale) and carbon pile rheostat in series with battery positive post and starter terminal. Connect voltmeter (15 volt scale) across starter. Rotate carbon pile to full-resistance position. Connect battery cable from battery negative post to starter frame. Adjust rheostat until starter voltage shown on voltmeter reads 11 volts. The current draw should be 85 amperes, with a minimum armature speed of 3,400 r.p.m.

b. Stall Test

Install starter motor in test bench. Follow instructions of equipment manufacturer and check stall torque of starter against following specifications. With applied battery voltage adjusted to 4 volts, stall torque should be 6.0 foot-pounds, minimum, with a current draw of 225 amperes.

6. DISASSEMBLING THE STARTER (FIG. 4)

Remove clevis pin from solenoid plunger linkage. Remove thru bolts and tap commutator end plate from field frame. Lift brush holder arms so brushes are raised from commutator. Hold brushes up by use of "U" shaped clips to outside of frame. Tap drive end housing free from dowel pin and remove drive end housing and armature assembly from field frame. Remove shield plate attaching screws and remove drive end housing from armature and drive assembly.

7. CLEANING THE STARTER PARTS

Do not immerse parts in cleaning solvent. Immersing field frame and coil assembly and/or armature will damage insulation. Wipe these parts with cloth **only.**

Do not immerse drive unit in cleaning solvent. The drive clutch is pre-lubricated at factory and solvent will wash lubrication from clutch. The drive unit may be cleaned with brush moistened with cleaning solvent and wiped dry with cloth.

8. REPLACING BRUSHES AND SPRINGS

Brushes that are worn more than ½ the length of a new brush, or are oil-soaked, should be replaced. The starter must be disassembled to install brushes and springs.

9. TESTING THE ARMATURE

a. Testing the Armature for Short Circuit

Place armature in growler and hold a thin steel blade parallel to core and just above it, while slowly rotating armature in growler. A shorted armature will cause blade to vibrate and be attracted to core. Replace a shorted armature.

b. Testing Armature for Ground

Touch armature shaft and end of a commutator bar with pair of test lamp test prods. If lamp lights, it indicates a grounded armature. Replace grounded armature.

c. Testing Commutator RunOut, Refacing and Undercutting

Place armature in pair of "Vee" blocks and

check runout with dial indicator. Check both shaft and commutator. A bent shaft requires replacement of armature. When commutator runout exceeds .003 inch, commutator should be refaced. Remove only sufficient metal to provide a smooth, even surface. After commutator is refaced, undercut insulation between bars to depth of $\frac{1}{32}$ inch with a thin, hacksaw blade, or Tool C-770. Undercut insulation square and full width of groove, and polish commutator with 000 sandpaper to remove burrs.

10. TESTING THE FIELD COILS FOR GROUND

Disconnect ground lead from the shunt field coil at terminal screw. Touch each of brush holders with a test lamp prod, while holding the other test prod against starter frame. Two of brush holders that are 180 degrees apart should cause test lamp to light, as they are intentionally grounded. The other two brush holders should not cause lamp to light when tested, as they are insulated. If these insulated brush holders cause lamp to light when tested, it indicates that the field coil is grounded. **Be sure brush pigtails or leads are not touching field frame.**

If field coils are grounded, inspect terminal insulation. If insulation is in good condition, test each coil separately after unsoldering connection wire. Replace grounded field coils. Test shunt field coil for continuity and for any ground, then reconnect ground lead.

11. REPLACING THE FIELD COILS

A pole shoe screwdriver should be used to remove and install field coils to prevent damage to pole shoe screws and for proper tightening. Pole shoes that are loose may cause armature core to rub pole shoes. This will decrease starter efficiency and damage the armature core and windings.

12. SERVICING THE BUSHINGS

Inspect armature shaft bearing surfaces and bearings for wear by placing core in vise equipped with soft jaws. Do not squeeze tightly. Try commutator end plate and the drive end nose casting by placing them on shafts and checking for side play. Replace commutator end plate assembly if bearing is worn. Also, replace drive end bearing if it is worn. The bearing should be well soaked in SAE 10-W Engine Oil before it is installed.

13. SERVICING THE DRIVE UNIT

To Remove drive from armature shaft, tap stop collar toward pinion and remove lock ring first. Place drive unit on shaft and, while holding armature, rotate pinion. The drive pinion should rotate smoothly in one direction (not necessarily easily), but should not rotate in opposite direction. If drive unit does not function properly or pinion is worn or burred, replace drive unit.

14. ASSEMBLING THE STARTER

(Refer to Fig. 4.) Lubricate armature shaft and splines with 10-W oil. Assemble drive end parts on armature using a new lock ring for stop collar. Install dust gravel shield, and slide assembly into field frame concentrically on nose casting, and slide assembly into field frame until end of commutator touches brushes. While holding armature against brushes with slight pressure, push brushes up and allow them to come to rest on commutator, slide armature assembly into place. Install commutator end plate and through bolts. Make sure end nose and plate are positioned on dowel pins, and tighten through bolts. Install solenoid plunger clevis pin and cotter key, but do not bend cotter key over until solenoid plunger travel and pinion clearance have been established. Be sure dust boot lip is over ring projection on solenoid unit.

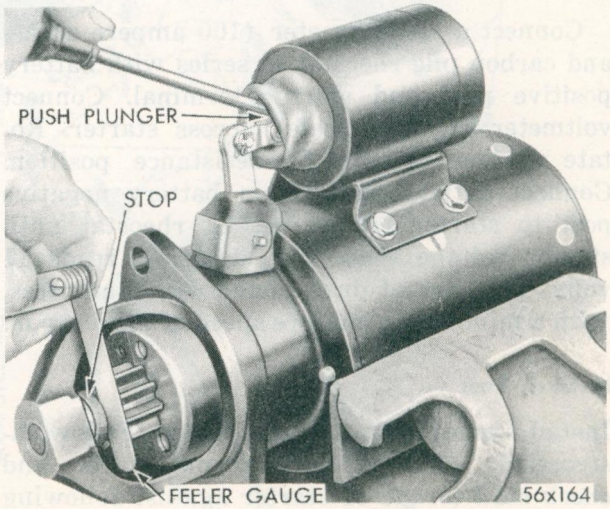


Fig. 5—Adjusting Starter Drive Pinion Clearance

15. ADJUSTING STARTER DRIVE GEAR (PINION) CLEARANCE (FIG. 5)

Place starter assembly in vise equipped with soft jaws and tighten vise sufficiently to hold starter. Push **in** on solenoid plunger link adjusting bolt (**NOT THE FORK LEVER**) until plunger bottoms. Measure clearance between end of pinion and pin stop with plunger seated and pinion pushed toward commutator end (Fig. 5). The clearance should be $\frac{3}{32}$ inch, plus $\frac{1}{32}$ inch or minus $\frac{1}{64}$ inch. Adjust for proper clearance by screwing link **in** or **out** of plunger as required. Bend cotter key and test starter operation under a free running test.

16. INSTALLING THE STARTER

Before installing starter in car, lubricate armature shaft ahead of pinion with 10-W oil and be sure starter and flywheel mounting surfaces are free of dirt and oil. These surfaces must be clean to make good electrical contact. Install starter from beneath car. Draw attaching bolts up tight and attach wires to solenoid switch. Lower car to floor; install battery cable and test operation of starter for proper engine cranking.

GENERATORS

17. REMOVAL

The generator is mounted on a bracket attached to engine and held in place by two bolts through end frames and bracket. It is secured at top by a bolt through drive end frame and the belt tightening strap. Disconnect battery ground terminal and wires at generator armature and field terminals. Loosen generator adjusting strap bolt, push generator to left to relieve belt tension and remove generator attaching bolts and generator.

18. CHARGING CIRCUIT RESISTANCE TEST (FIG. 6)

Before an output test of generator is made, charging unit should be tested for high resist-

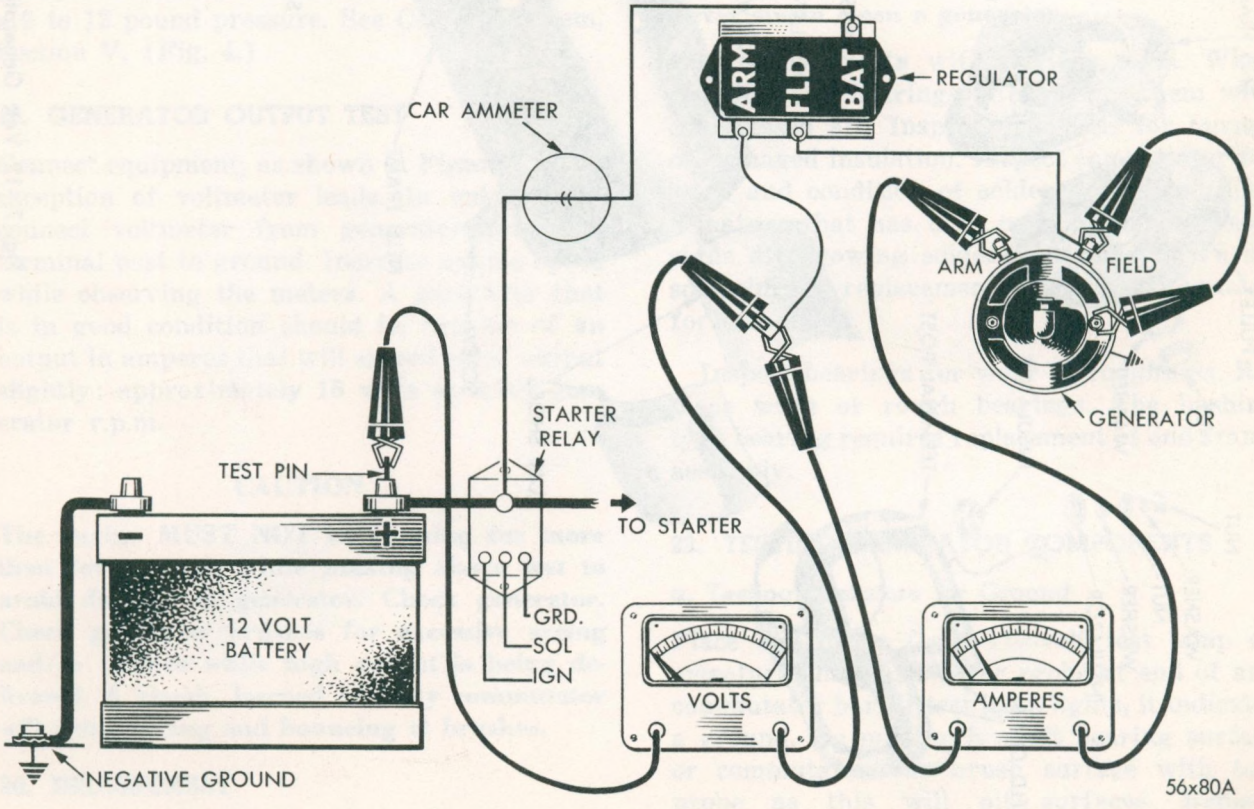


Fig. 6—Charging Circuit Resistance Test

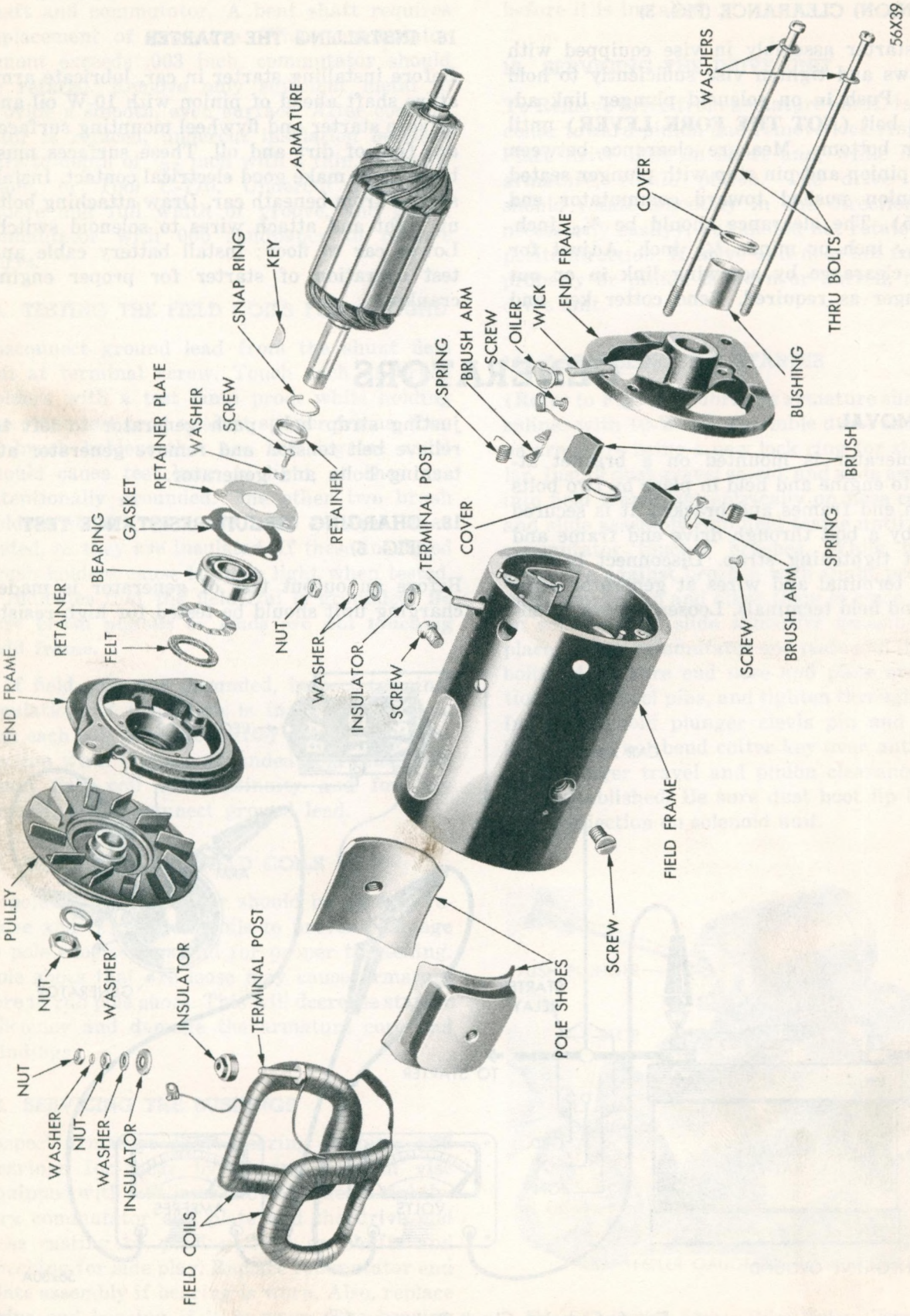


Fig. 7—12 Volt Generator (Standard Equipment)

ance due to loose connections, damaged wiring and burned relay contacts. The generator drive belt tension should also be checked and adjusted if tension is incorrect.

Connect test equipment, as shown in Figure 6. The ammeter is connected at generator and volt meter is attached to armature lead so that any voltage loss in test ammeter will not register on voltmeter. Start engine, increase engine speed until 10 amperes register on test ammeter, and read voltmeter. The voltage shown will be voltage drop of charging circuit and should not exceed .50 volt. A voltage drop that exceeds .50 volt indicates high resistance from a loose connection, burned relay contacts or a partially broken wire. Where voltage drop exceeds .50 volt, a-point-to-point check is required. Move one of voltmeter leads back along circuit toward other test lead connection, checking voltage at each terminal connection. A sudden drop in voltage indicates that high resistance is present between that point and last point tested. Clean relay contacts, tighten loose connections and replace damaged wiring.

Adjust belt tension by measuring with a scale applied at center of longest span between pulleys. The deflection should be ¼ inch with a 9 to 12 pound pressure. See Cooling System, Section V, (Fig. 4.)

19. GENERATOR OUTPUT TEST

Connect equipment, as shown in Figure 6, with exception of voltmeter leads. In output test, connect voltmeter from generator armature terminal post to ground. Increase engine speed while observing the meters. A generator that is in good condition should be capable of an output in amperes that will exceed rated output slightly: approximately 15 volts at 2,300 generator r.p.m.

CAUTION

The engine MUST NOT be running for more than few seconds while making above test to avoid damage to generator. Check generator. Check generator brushes for excessive arcing and/or bounce while high output is being delivered. A rough, burned or dirty commutator will cause arcing and bouncing at brushes.

20. DISASSEMBLY

To disassemble a standard type generator (Fig. 7), remove through bolts and pull end plate from field frame. Slide armature and drive end frame assembly from generator field frame. Place armature core in vise equipped with soft jaws, and remove pulley with Tool C-3505. Remove drive key and press end frame assembly from armature. Do not remove field coils from frame at this time.

Generators used on Air Conditioned cars (Fig. 8) have a ball bearing at commutator end. To remove drive end frame, remove through bolts. Pull end frame free of dowel pin and rotate end frame far enough so lugs are away from terminal posts.

Support generator in arbor press on plates against end frame lugs. Press end plate from shaft while supporting generator assembly to prevent it from falling when free. Complete disassembly operation in same manner as for a standard generator.

21. CLEANING AND INSPECTION

CAUTION

Do not immerse armature, field frame and field assembly, or bearing felts in cleaning solution. Never steam clean a generator.

Wipe above parts with a clean cloth. When cleaning ball bearings do not spin them with compressed air. Inspect field coils for burned or damaged insulation. Inspect commutator for wear and condition of soldered coil leads. An armature that has been overheated will show signs of throwing solder and will require resoldering or replacement. Inspect commutator for trueness.

Inspect bearings for wear or roughness. Replace worn or rough bearings. The bushing type bearing requires replacement of end frame assembly.

22. TESTING GENERATOR COMPONENTS

a. Testing Armature for Ground

Place one probe from 110-volt test lamp on armature shaft and other probe at end of any commutator bar. If test lamp lights, it indicates a ground. Do not touch shaft bearing surface or commutator bar brush surface with test probe as this will pit surfaces. Replace grounded armatures.

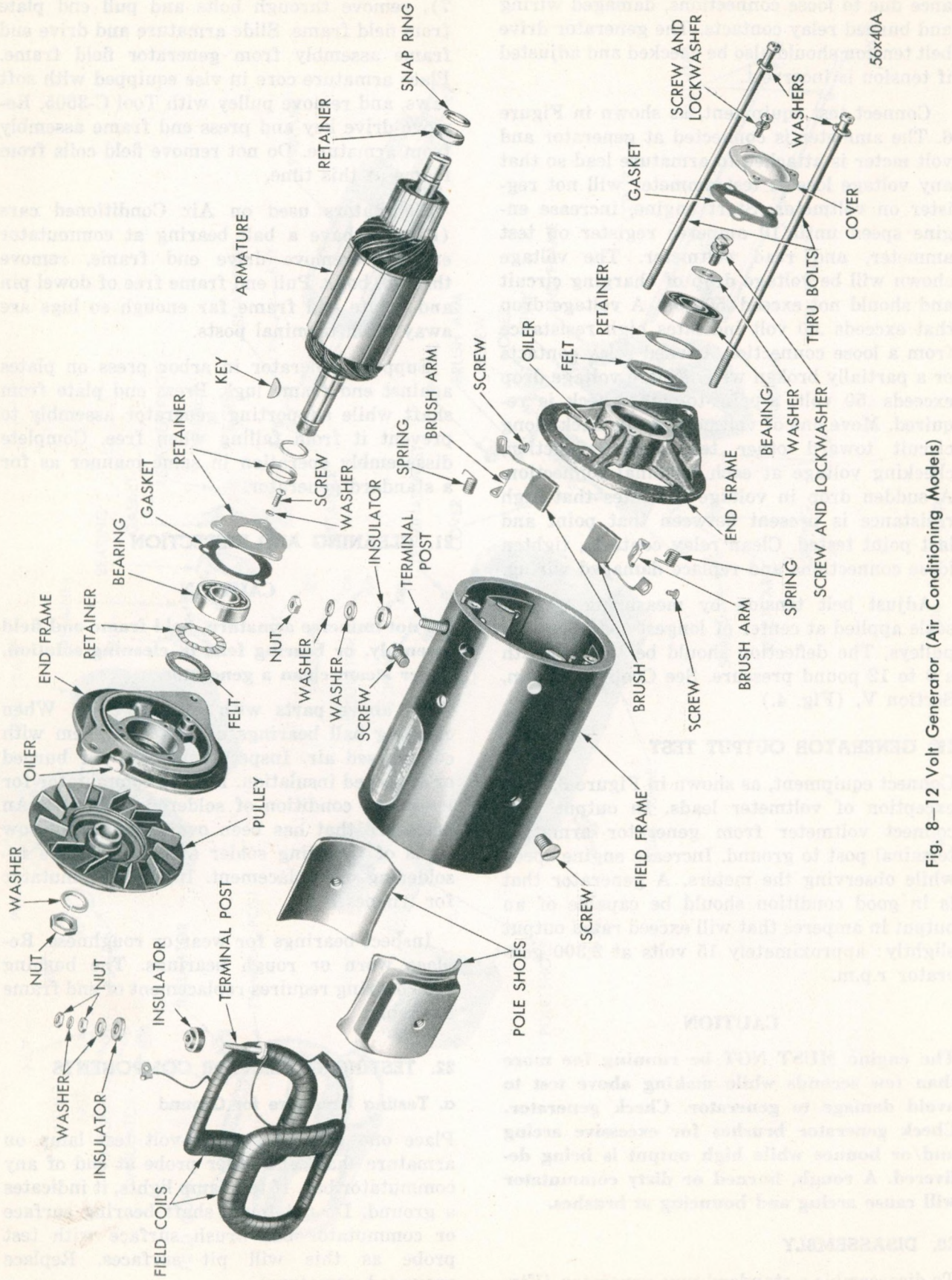


Fig. 8—12 Volt Generator (Air Conditioning Models)

b. Testing Armature for Short Circuit

Place armature in growler and, while rotating armature hold thin steel blade parallel to core and just above it. A shorted armature will cause steel blade to vibrate and be attracted to core. Replace shorted armature.

c. Testing Field Frame Assembly for Ground

Disconnect "ARM" terminal field lead from insulated brush holder. Touch a 110-volt lamp probe to generator "FIELD" terminal post, while holding other probe against good ground on field frame (be sure brush lead terminals are not touching a ground). The lamp should not light. If lamp lights, a ground exists, and it will be necessary to determine whether ground is in field coils or field terminal post.

Remove terminal post from field frame and retest from field lead to ground. If lamp lights, field coils or connecting lead is grounded. Move connecting lead between two coils away from frame. If light still burns, ground is in field coils.

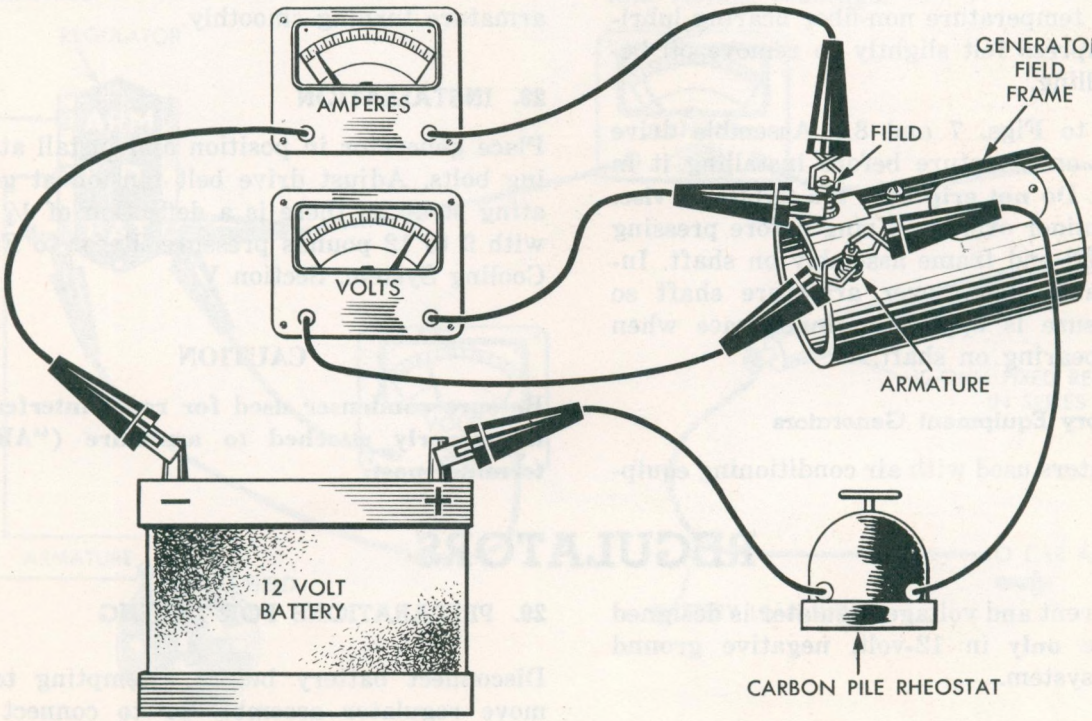
Touch one of 110-volt test lamp probes to "ARM" terminal post and field frame. If lamp lights, it indicates that either terminal post or brush holder is grounded. Remove terminal post and retest brush holder. If lamp lights, brush holder is grounded. Replace defective parts. It is necessary to replace field frame if, insulated brush holder is grounded.

d. Testing Field Current Draw (Fig. 9)

Test field coils for short circuits between windings, high resistance connections, or for improper coils, by connecting test equipment, as shown in Figure 9. Adjust battery voltage to specified voltage of 10-volts with rheostat. The reading on ammeter indicates field current draw. A current reading that exceeds 1.2 to 1.3 amperes indicates that coil windings are shorted, or that wrong coils have been installed. A current reading that is less than specified indicates poor electrical connections or wrong field coils. Replace short circuited or improper coils, or re-solder defective connections.

23. SERVICING THE ARMATURE

Reface commutator if runout exceeds .0005 inch, or if it is rough, burned, or worn so that insulation between bars is too high. Undercut insulation between commutators bars to depth



56x145

Fig. 9—Testing Field Current Draw

of 1/32 inch, the full width of insulation. Metal particles are sometimes embedded in grooves following undercutting and should be removed.

24. REPLACING FIELD COILS

To replace field coils, a pole shoe screwdriver, such as Tool C-3078, should be used to prevent damage to screws and to assure proper tightening when installing coils. Pole shoes that are loose will rub armature core, causing loss of efficiency and damage to armature.

25. REPLACING BRUSHES AND SPRINGS

Brushes that are oil soaked or worn to ½ length of a new brush should be replaced. Sand new generator brushes to fit contour of commutator. With new type brush holder, it is difficult to measure spring tension (which must be done after generator is assembled). It is suggested that new springs be installed when brushes are replaced.

26. ASSEMBLING THE GENERATOR

a. Standard Generators

Soak felt washers and Oilite bushing in clean engine oil. Pack ball bearing about half full with high temperature non-fiber bearing lubricant. Compress felt slightly to remove oil before installing.

(Refer to Figs. 7 and 8.) Assemble drive end parts on armature before installing it in generator. **Do not grip core too tightly in vise.** Install retainer over snap ring before pressing bearing and end frame assembly on shaft. Install suitable sleeve over armature shaft so that pressure is applied to inner race when pressing bearing on shaft.

b. Accessory Equipment Generators

On generators used with air conditioning equipment, install armature and drive end assembly in generator field frame. Install commutator end plate and through bolts. Place felt and shield in commutator end plate and press bearing on shaft, applying pressure to inner race. Install shield.

c. Testing After Assembly

The generator should be tested before it is installed on car. If proper bench test equipment is not available, it is possible to motor test generator. A generator that will motor freely with specified voltage applied will, in most cases, operate properly when driven as a generator.

27. MOTORING TEST

Connect a carbon pile rheostat and test ammeter in series with positive post of 12-volt battery and generator armature terminal post. Connect a jumper lead from field terminal post to ground. Connect a jumper lead to battery negative post and generator frame. This will cause armature to rotate as a motor. Adjust battery voltage to 10 volts. The reading on test ammeter should be 3.4 to 3.9 amperes with armature turning smoothly.

28. INSTALLATION

Place generator in position and install attaching bolts. Adjust drive belt tension at generating strap so there is a deflection of ¼ inch with 9 to 12 pounds pressure. Refer to Fig. 4, Cooling System, Section V.

CAUTION

Be sure condenser used for radio interference is properly attached to armature ("ARM") terminal post.

REGULATORS

The current and voltage regulator is designed to operate **only** in 12-volt, negative ground electrical system.

NOTE: Do not attempt to adjust unit unless proper procedures are thoroughly understood. Otherwise, damage to entire electrical system may result.

29. PREPARATIONS FOR TESTING

Disconnect battery before attempting to remove regulator assembly or to connect test equipment. Do not connect test equipment. Do not connect battery again until after regulator removal and/or installation has been completed. Do not connect battery when installing

test equipment until equipment is installed and all connections are protected against accidental ground. Failure to adopt these pre-cautions may result in damage to electrical circuit parts or wiring.

Before testing regulator assembly, make sure generator drive belt tension is correct. The battery specific gravity should be 1.210 or higher. Check charging circuit resistance. The voltage drop of insulated side of circuit should not exceed .50 volt, with 10 amperes of current flowing. The ground side of charging circuit should also be tested.

30. NORMALIZING THE REGULATOR TEMPERATURE

Connect a test ammeter in series between battery lead and regulator "Batt" terminal. Connect a test voltmeter from regulator "Batt" terminal to ground. Connect a variable resistance across battery. Start engine, adjust engine speed to 1,500 r.p.m., and observe test ammeter. Adjust variable resistance to obtain a load of 7 amperes. Maintain this 7 ampere load for 15 minutes to normalize regulator temperature.

31. TESTING REGULATOR TEMPERATURE

When testing regulator, keep cover in place and make sure temperature at regulator is known. The regulator armature hinges are temperature compensated and control will vary with temperature changes.

To measure temperature at regulator, hold an accurate Fahrenheit thermometer two inches from cover. The correct voltage setting of regulator for various temperatures with 7 amperes flowing is shown in Specifications.

32. TESTING THE VOLTAGE REGULATOR SETTING (FIG. 10)

Connect test equipment, start engine and operate at 1,500 r.p.m. Hold Fahrenheit thermometer 2 inches from regulator cover and note temperature reading. Observe voltage on test voltmeter. Compare voltage reading and temperature with those shown in Specifications. If adjustment is required, decrease engine speed to slow idle. Remove regulator cover and bend lower hanger of voltage regulator **down** to increase voltage or **up** to decrease voltage (Fig. 11). Replace regulator cover, increase engine speed to 1,500 r.p.m., and check temperature and voltage readings.

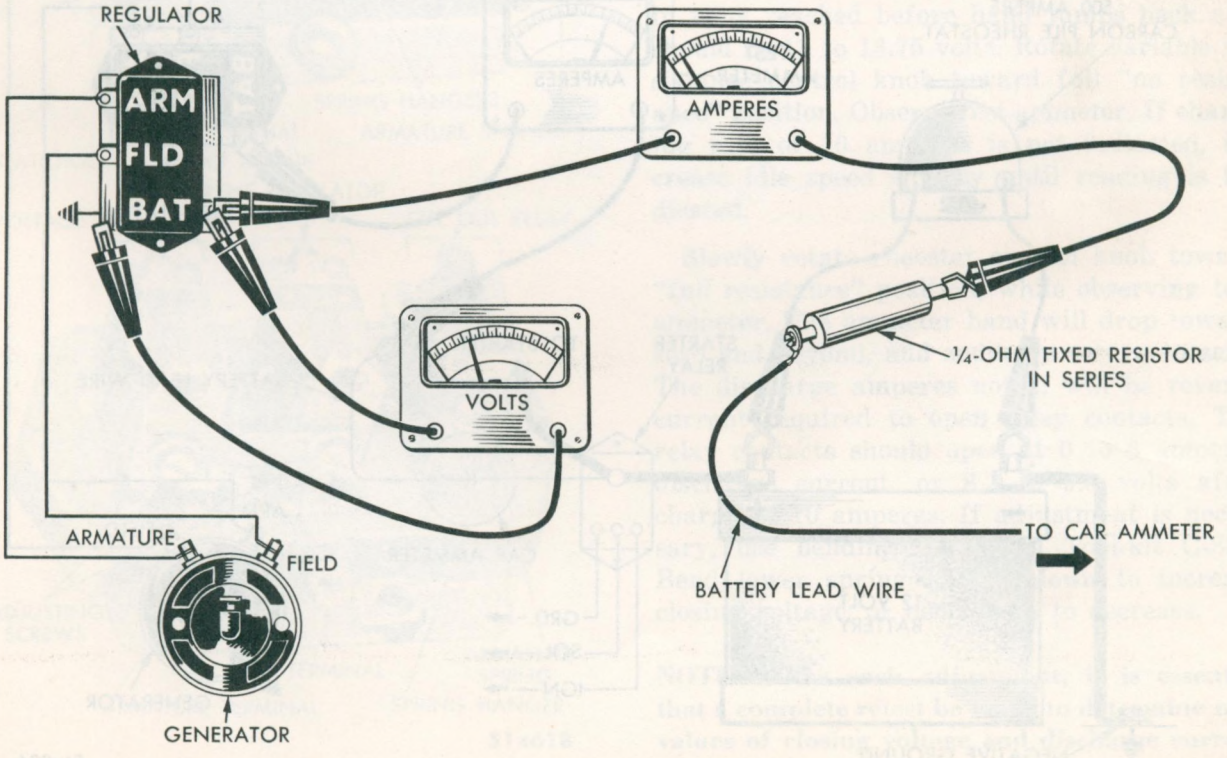


Fig. 10—Voltage Regulator Test

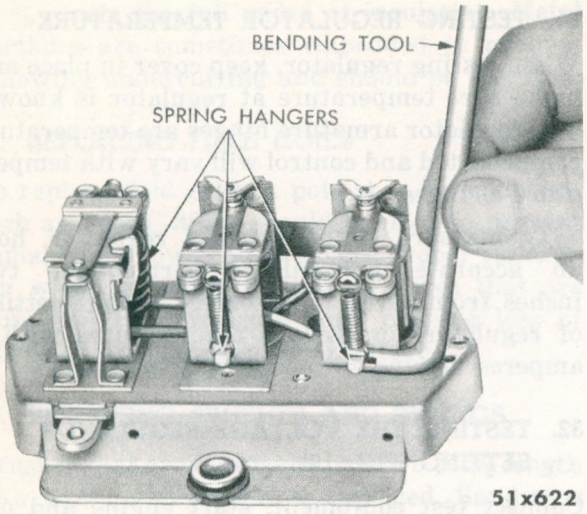


Fig. 11—Adjusting Armature Spring Tension

WARNING

The regulator must be cycled by reducing engine speed low enough for cut-out relay contacts to open, before increasing engine speed to 1,500 r.p.m. when retesting after each adjustment. The regulator cover must be in place when test is made.

33. TESTING THE CURRENT REGULATOR

The current regulator is temperature compensated and temperature must be considered in same manner as when testing voltage regulator. The test of current regulator would normally be made following test procedure for voltage regulator. When test of current regulator immediately follows voltage regulator test, generator should be run at its rated output of 30 amperes for 15 minutes (in addition to voltage regulator 15 minute run) before checking or adjusting current regulator. Test as follows:

Install test equipment (Fig. 12), start engine and increase speed to 2,000 r.p.m. Adjust variable resistance across battery until current settles to steady ampere output. The current regulator should limit current output as listed in Data and Specifications.

If adjustment is required, reduce engine speed to slow idle and remove cover from regulator. Bend lower current regulator spring hanger **down** to increase current output setting or **up** to decrease setting, (Fig. 13).

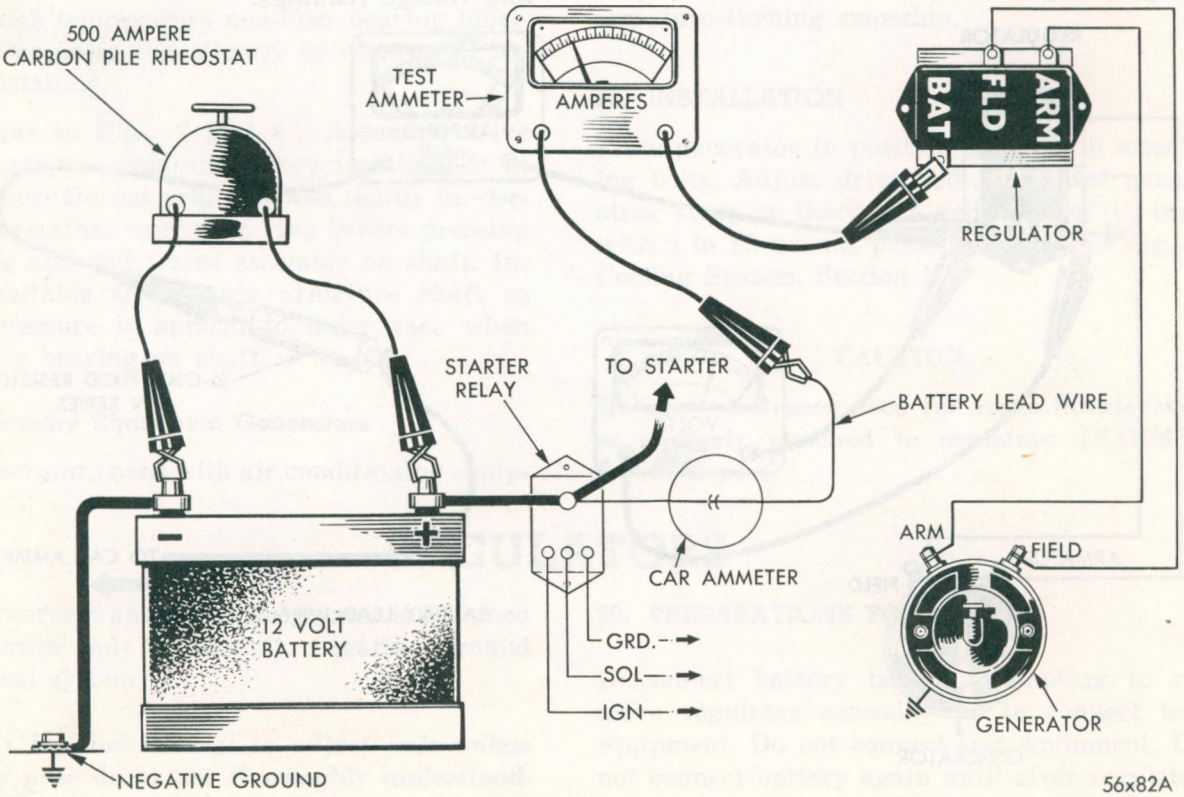


Fig. 12—Current Regulator Test

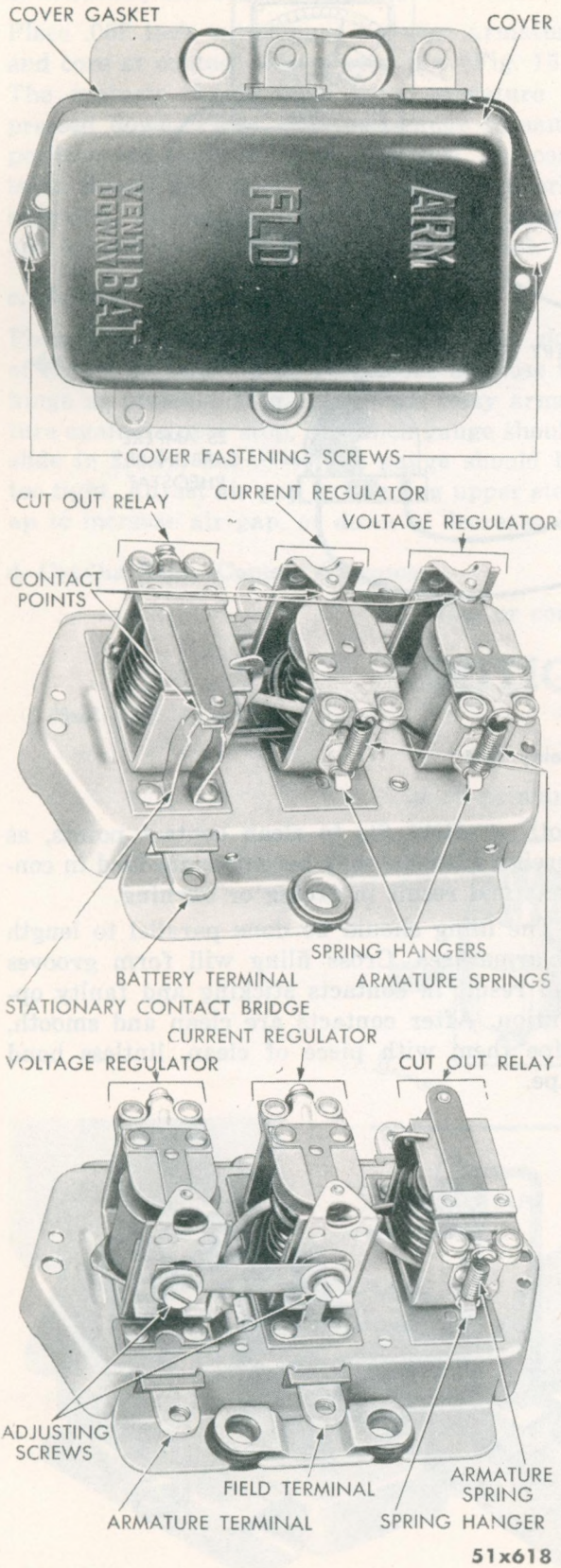


Fig. 13—Current and Voltage Regulator

WARNING

The current regulator must be cycled by reducing engine speed, low enough to open cut-out relay contacts after each adjustment. Retest the new setting after each adjustment with cover in place.

34. TESTING CUT-OUT RELAY (FIG. 14)

Connect test ammeter in series between regulator "Batt" terminal and battery lead wire. Connect variable resistance in series between regulator field terminal and generator field lead wire. Connect test voltmeter (0 to 15 — volts) from regulator "ARM" terminal to ground.

If the present test immediately follows tests of voltage and current regulators, it is not necessary to normalize regulator temperature. If regulator assembly is cold, normalize the temperature.

Start engine and adjust speed to slow idle. Rotate variable resistance control knob to full resistance position. Slowly rotate variable resistance control knob toward "no resistance" position, while carefully observing voltmeter. Increase engine speed slowly. The relay contacts close when voltmeter hand jumps back slightly. The closing voltage is highest reading in volts reached before hand jumps back and should be 13 to 13.75 volts. Rotate variable resistance control knob toward full "no resistance" position. Observe test ammeter. If charging rate of 10 amperes is not indicated, increase idle speed slightly until reading is indicated.

Slowly rotate rheostat control knob toward "full resistance" position, while observing test ammeter. The ammeter hand will drop toward zero and beyond, and suddenly return to zero. The discharge amperes noted, will be reverse current required to open relay contacts. The relay contacts should open at 0 to 6 amperes discharge current, or 8.2 to 9.3 volts after charge of 10 amperes. If adjustment is necessary, use bending tool from Tool-kit C-828. Bend lower spring hanger **down** to increase closing voltage, or bend it **up** to decrease.

NOTE: After each adjustment, it is essential that a complete retest be made to determine new values of closing voltage and discharge current required to open relay contacts. Regulator cover must be in place when test is made.

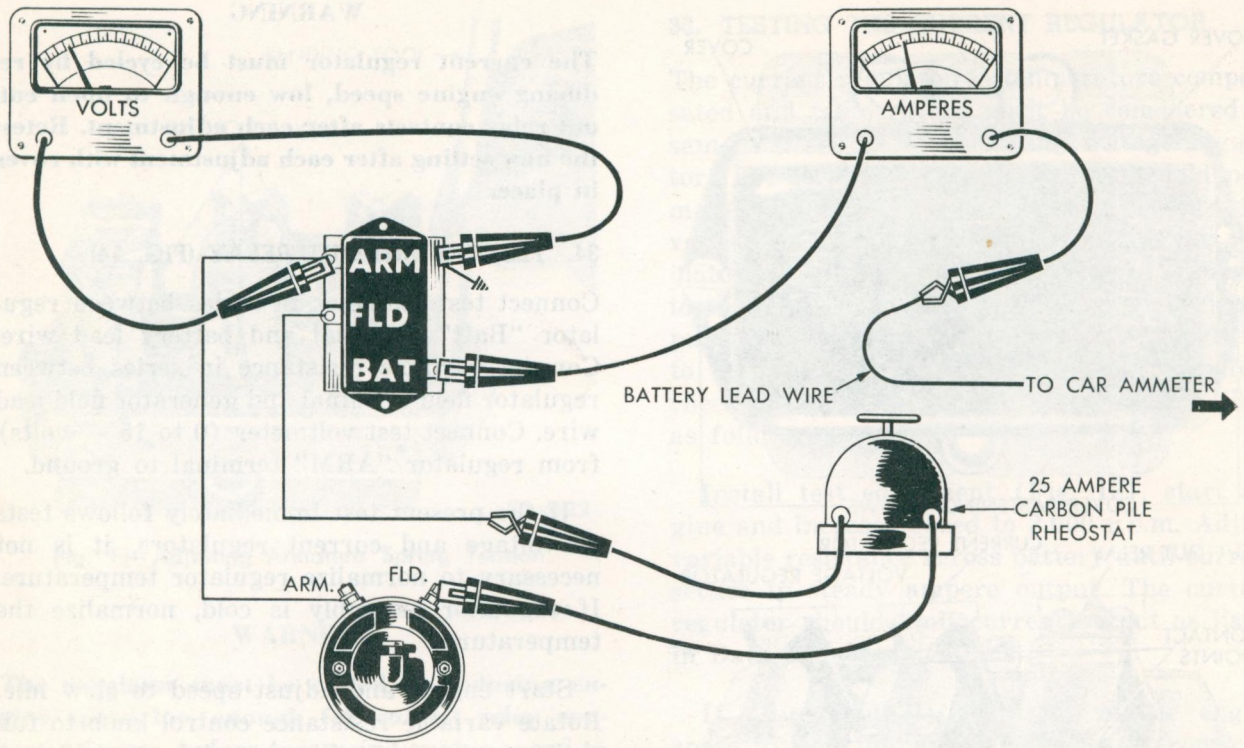


Fig. 14—Cut-Out Relay Test

35. SERVICING THE REGULATOR CONTACT POINTS

a. Inspecting and Cleaning Contacts

Inspect contact points of all three units. The contact points become silver gray during normal use. File burned and oxidized points with a clean contact point file. Do not remove too much material. Never use sandpaper, emery cloth or dirty file to clean contact points, as foreign material may become embedded in contacts and result in arcing or burning.

The filing should be done parallel to length of armatures. Cross filing will form grooves and result in contacts sticking and faulty operation. After contacts are clean and smooth, wipe them with piece of clean, lintless bond tape.

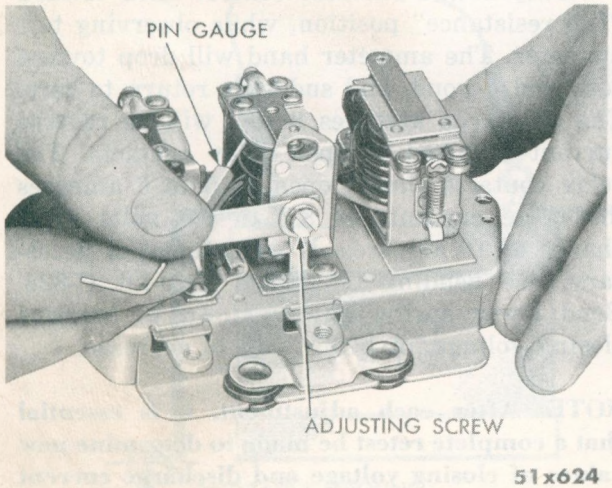


Fig. 15—Checking Regulator Air Gaps

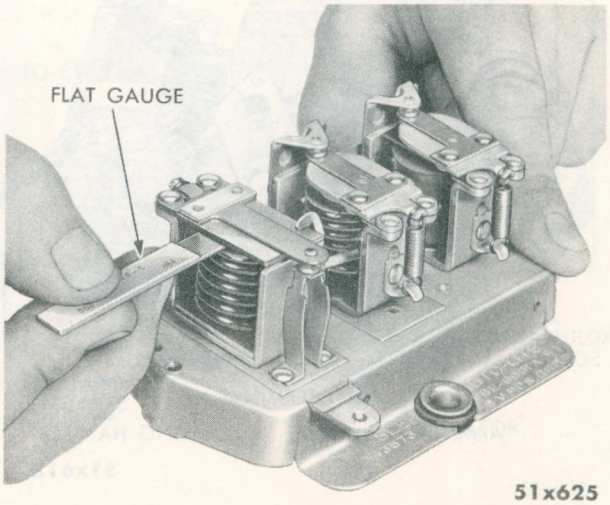


Fig. 16—Checking Cut-Out Relay Air Gaps

b. Adjusting Air Gaps (Regulator)

Place .052 inch wire gauge between armature and core at contact side of stop pin (Fig. 15). The contacts should open when armature is pressed down. Place .048 inch gauge in same position and press down on armature. The contacts should just open if air gap is properly adjusted. Adjust air gap by loosening screw and lowering or raising stationary contact.

c. Cut-Out Relay Air Gap

Place flat .031 inch gauge between lower side of armature and top of relay core as close to hinge as possible (Fig. 16). With relay armature against upper stop, .031 inch gauge should slide in freely, but .034 inch gauge should be too tight. Adjust air gap by bending upper stop **up** to increase air gap, or **down** to decrease it.

d. Cut-Out Relay Contact Clearance

Adjust contact clearance by expanding or contracting bridge (Fig. 17). The proper clearance is .015 inch.

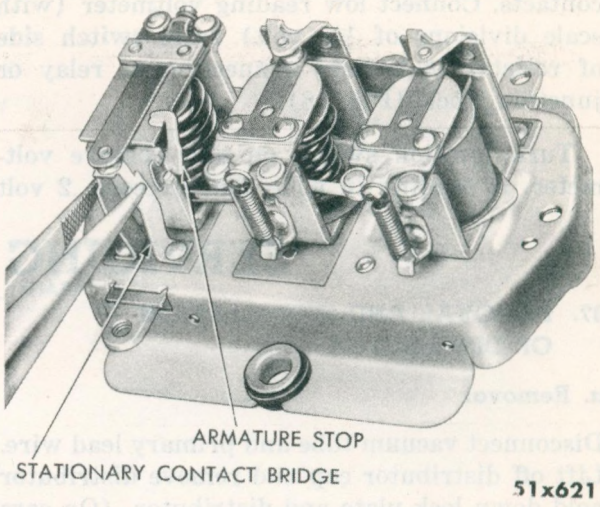


Fig. 17—Adjusting Cut-Out Relay Contact Clearance

IGNITION SYSTEM

36. TESTING PRIMARY CIRCUIT RESISTANCE (FIG. 18)

It is essential to good ignition that all primary connections be clean and tight. Connect jumper wire from distributor primary terminal to ground. This eliminates necessity of closing

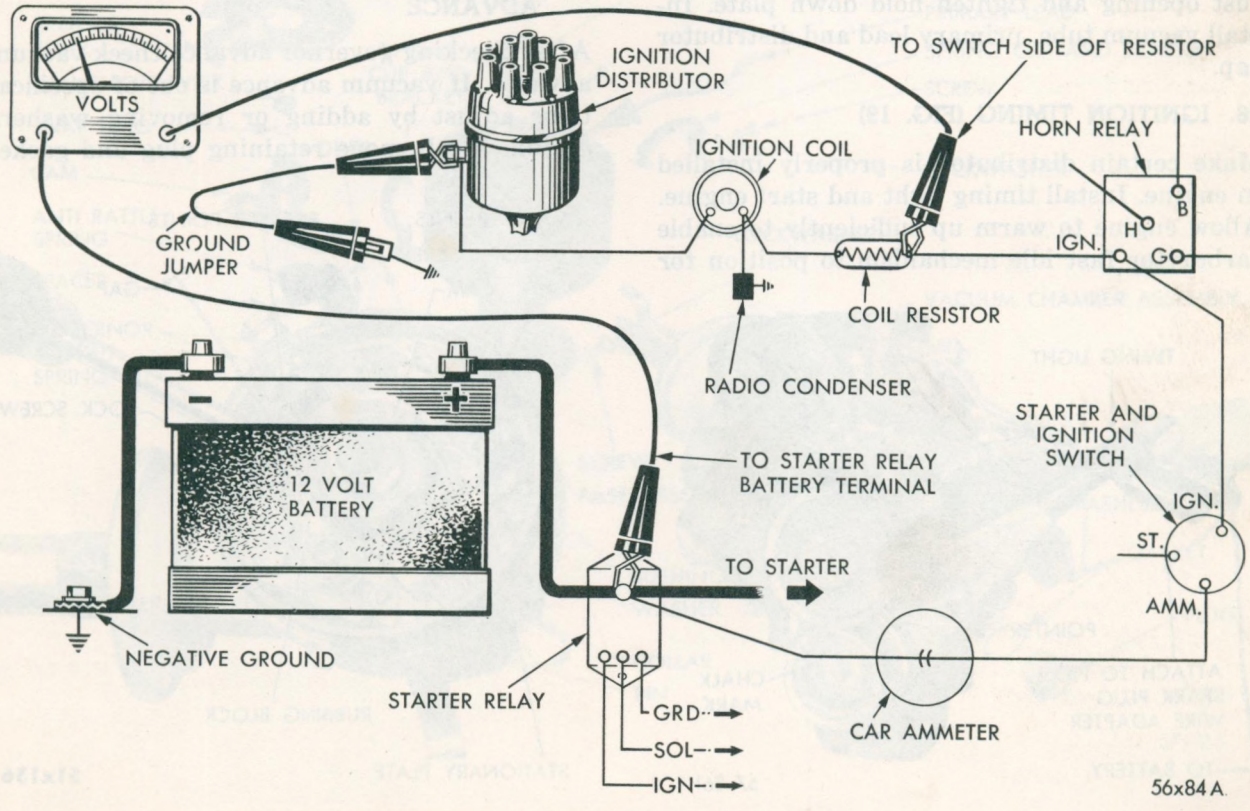


Fig. 18—Testing Primary Circuit Resistance

contacts. Connect low reading voltmeter (with scale divisions of $\frac{1}{10}$ volt) from switch side of resistor to battery connection at relay or junction block (Fig. 18).

Turn ignition switch on and observe voltmeter. A reading in volts that exceeds .2 volt indicates a loose connection in circuit between voltmeter leads or poor contact in ignition switch. Move key off and on while noting voltmeter. A reading that varies, also indicates poor contact in switch. Clean and tighten loose connections and/or replace defective switch.

SERVICING DISTRIBUTOR

37. REMOVAL AND INSTALLATION OF DISTRIBUTOR

a. Removal

Disconnect vacuum tube and primary lead wire. Lift off distributor cap and remove distributor hold down lock plate and distributor. (On cars equipped with power brakes remove vacuum line fitting in manifold.)

b. Installation

Make sure number one piston is at top dead center and install distributor so that rotor is pointing to number one firing position. Install lock plate and screw, but do not tighten. Rotate crankshaft to align specified degree mark on vibration damper with ignition timing indicator pointer. Rotate distributor until contacts are just opening and tighten hold down plate. Install vacuum tube, primary lead and distributor cap.

38. IGNITION TIMING (FIG. 19)

Make certain distributor is properly installed in engine. Install timing light and start engine. Allow engine to warm up sufficiently to enable carburetor fast idle mechanism to position for slow idle speed. Loosen distributor lock plate and rotate distributor clockwise or counterclockwise to align proper degree mark on vibration damper with ignition timing indicator points. Tighten lock plate.

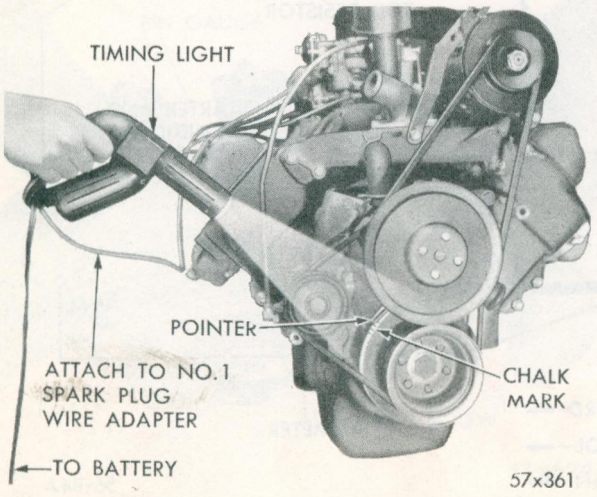


Fig. 19—Ignition Timing

39. CHECKING DISTRIBUTOR GOVERNOR ADVANCE

Install distributor assembly in test bench and check governor advance as recommended by equipment manufacturer.

Adjust governor advance by bending outer spring lug of light spring for low speed and outer lug of heavy spring for high speed operation.

40. CHECKING DISTRIBUTOR VACUUM ADVANCE

After checking governor advance check vacuum advance. If vacuum advance is out of specifications adjust by adding or removing washers as follows: Remove retaining plug and gasket

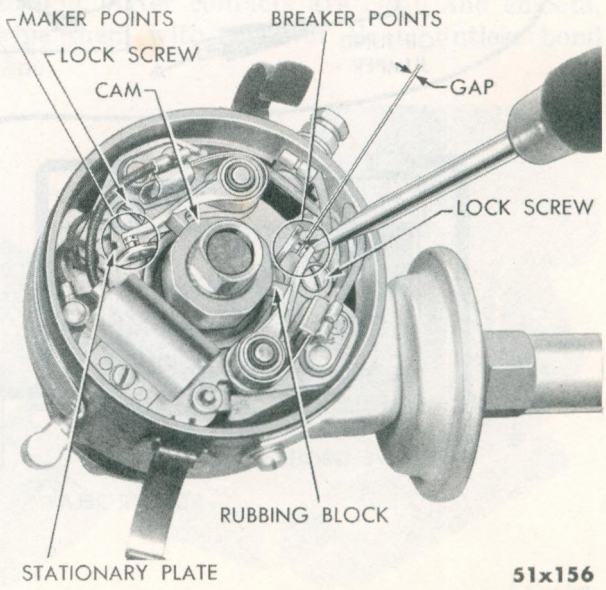


Fig. 20—Installing and Aligning Contacts

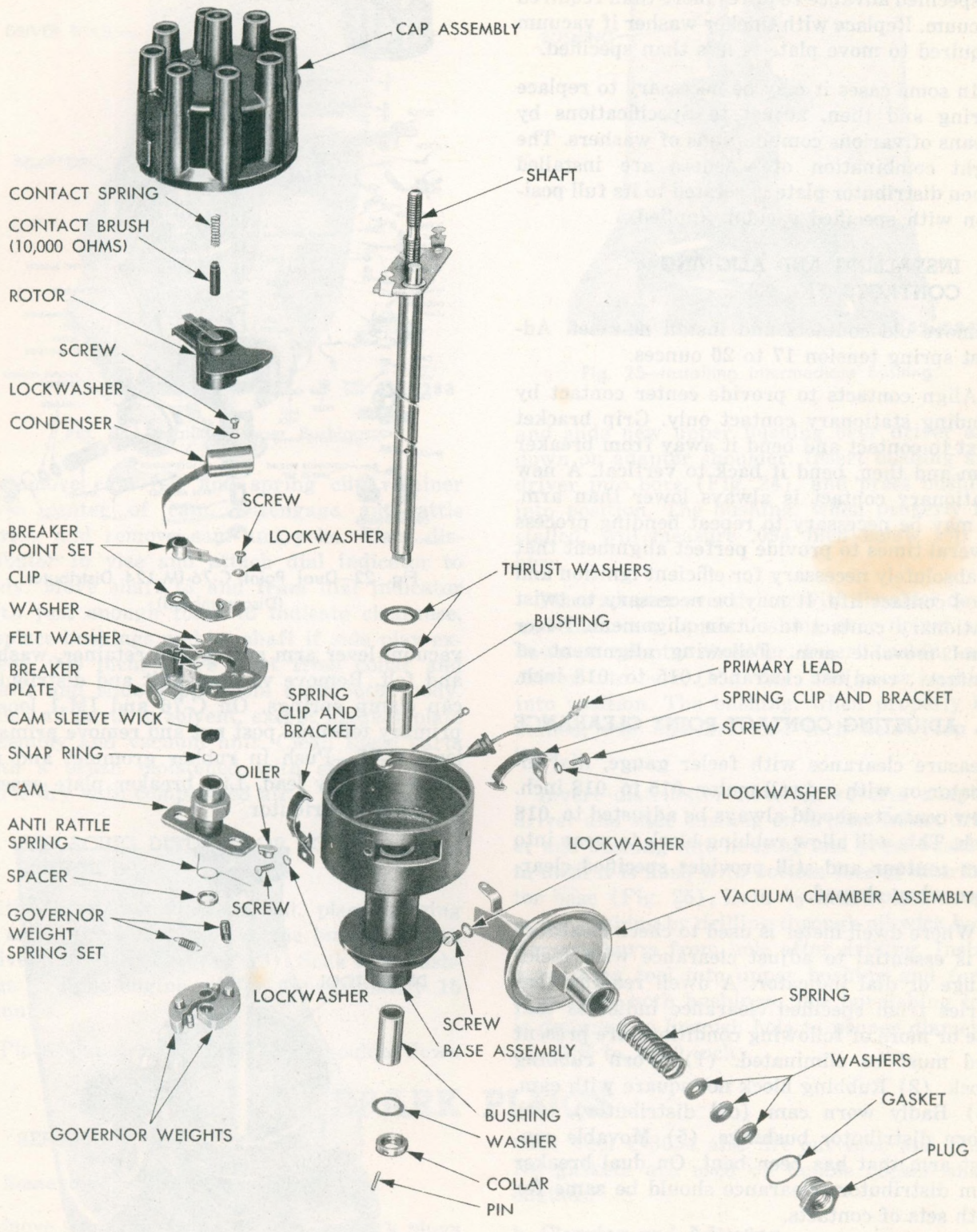


Fig. 21—Single Point C-75 Distributor (Disassembled)

and remove washers. Check thickness of removed washers and substitute thinner washer if specified advance requires more than required vacuum. Replace with thicker washer if vacuum required to move plate is less than specified.

In some cases it may be necessary to replace spring and then, adjust to Specifications by means of various combinations of washers. The right combination of washers are installed when distributor plate is rotated to its full position with specified vacuum applied.

41. INSTALLING AND ALIGNING CONTACTS (FIG. 20)

Remove old contacts and install new set. Adjust spring tension 17 to 20 ounces.

Align contacts to provide center contact by bending stationary contact only. Grip bracket next to contact and bend it away from breaker arm and then, bend it back to vertical. A new stationary contact is always lower than arm. It may be necessary to repeat bending process several times to provide perfect alignment that is absolutely necessary for efficient ignition and good contact life. It may be necessary to twist stationary contact to obtain alignment. **Never bend movable arm.** Following alignment of contacts; readjust clearance .015 to .018 inch.

42. ADJUSTING CONTACT POINT CLEARANCE

Measure clearance with feeler gauge, dial indicator or with a dwell meter .015 to .018 inch. New contacts should always be adjusted to .018 inch. This will allow rubbing block to wear into cam contour and still provides specified clearance when shaped.

Where dwell meter is used to check clearance it is essential to adjust clearance with feeler gauge or dial indicator. A dwell reading that varies from specified clearance indicates that one or more of following conditions are present and must be eliminated. (1) Worn rubbing block. (2) Rubbing block not square with cam. (3) Badly worn cam (old distributor). (4) Worn distributor bushings. (5) Movable contact arm that has been bent. On dual breaker arm distributors clearance should be same for both sets of contacts.

43. DISASSEMBLY OF DISTRIBUTOR (FIGS. 21 AND 22)

Remove vacuum chamber retaining screws,

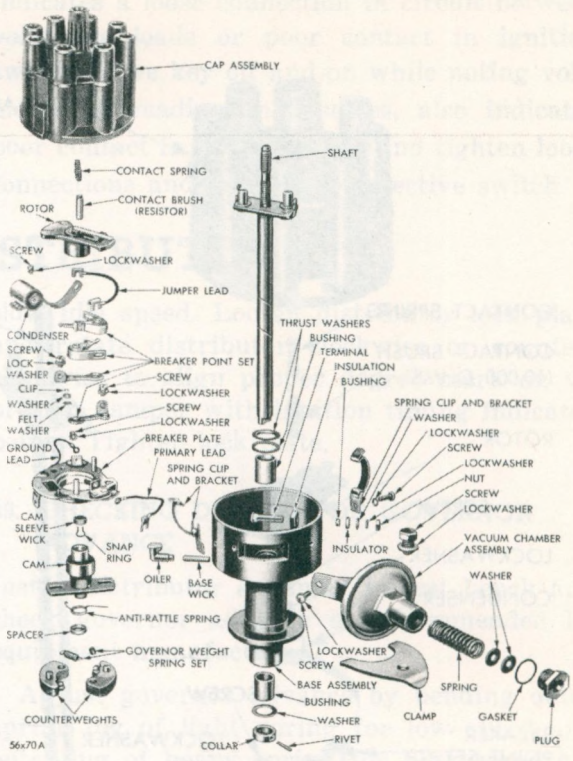


Fig. 22—Dual Point C-76-IM-124 Distributor (Disassembled)

vacuum lever arm spring clip retainer, washer and felt. Remove vacuum unit and distributor cap clamp springs. On C-76 and IM-1 loosen primary terminal post nut and remove primary lead. C-75—Push in rubber grommet and remove primary lead. Lift breaker plate assembly from distributor.

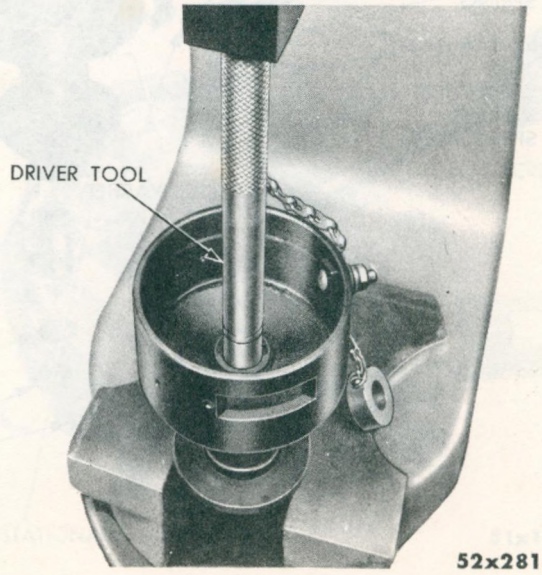


Fig. 23—Removing Drive Shaft Bushing

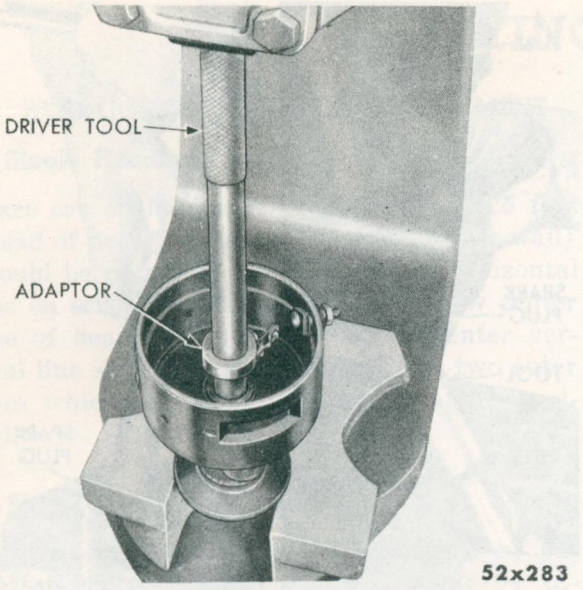


Fig. 24—Installing Upper Bushings

Remove cam felt and spring clip retainer from center of cam. Disengage anti-rattle spring and remove cam and yoke. Place distributor in vise and attach dial indicator to body. Move shaft **to** and **from** dial indicator with just enough force to indicate clearance. Replace bushings and/or shaft if side play exceeds .005 inch. Drive rivet from collar and shaft, and slide shaft from distributor body. Wash all parts in solvent, except breaker plate assembly and vacuum unit. Clean these parts with a brush moistened with solvent. Blow parts dry with compressed air.

44. REPLACING DISTRIBUTOR BODY BUSHINGS

With distributor disassembled, place housing in arbor press and remove the bushings with driver, Tool C-3041 (Fig. 23). Soak new bushings in light engine oil for approximately 15 minutes.

Place adapter over driver with shoulder down and slide new upper bushing over driver and down on adapter shoulder. Insert bushing and driver into bore (Fig. 24), and press bushing into position. The bushing, when properly installed, will measure .094 inch below top of bore.

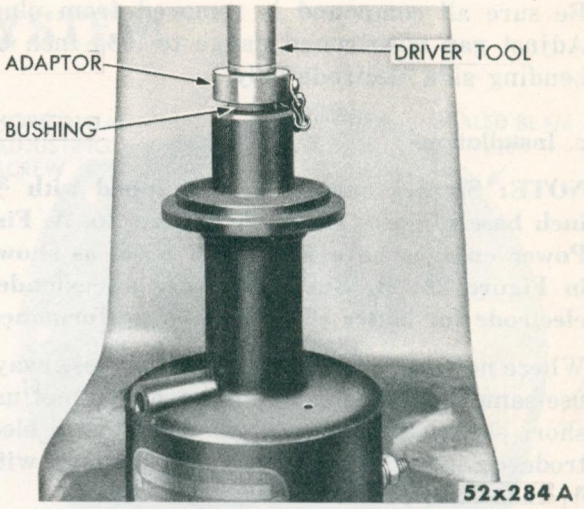


Fig. 25—Installing Intermediate Bushing

Place adapter over driver with shoulder down and slide new upper bushing over driver and down on adapter shoulder. Insert bushing and driver into bore (Fig. 24), and press bushing into position. The bushing, when properly installed, will measure .094 inch below top of bore.

Invert distributor housing, reverse adaptor driver and slide bushing on driver. Insert driver and bushing into housing and press bushing **in** until it is flush with bottom face of distributor base (Fig. 25). Drill ⅛ inch hole through upper bushing by drilling through oil wick hole. Remove burrs from hole after drilling. Install burnishing tool into upper bushing and force it through both bushings. The burnishing tool is designed to burnish hole to proper diameter of .4995 to .5000 inch.

SPARK PLUGS

45. SERVICING SPARK PLUGS

a. Removal

Remove single rocker shaft engine spark plugs with Tool C-3054. For double rocker shaft engine remove ignition cable cover, air cleaner on right side and heater blower. Loosen plug with Tool C-3054 and lift out tube and plug. No gaskets are used on double rocker shaft engines.

b. Cleaning and Adjusting

Spark plugs that are badly oxidized or have electrodes that show considerable wear should be replaced. Clean plugs in blast type cleaner.

Be sure all compound is removed from plug. Adjust gap with round gauge to .035 inch by bending side electrode only.

c. Installation

NOTE: Spitfire engines are equipped with ⅜ inch base plug, as shown in Figure 26, A. Fire Power engines have a ¾ inch base, as shown in Figure 26, B. Both plugs use an extended electrode for better efficiency and performance.

Where necessary to replace spark plugs, always use same type plug as one removed. Do not use short electrode plug in place of extended electrode or interchange ⅜ inch base plugs with ¾ inch base plugs.

To assure good heat transfer clean seats in head and also tube (double rocker shaft engines). Use new gaskets on plugs for single rocker shaft engines. **No gaskets are used on double rocker shaft engines.** When installing plugs in double rocker shaft engines, place plug in socket wrench and lower tube over plug, (Fig. 27), before installing. Tighten plugs 32 foot-pounds torque.

46. HIGH TENSION CABLES, DISTRIBUTOR CAP AND ROTOR

a. Cables

Clean high tension cables and inspect for cracks and chafed spots. Replace damaged cables. Fit terminals to spark plug caps so they will fit snugly when installed. Terminal clips should fit tight in cap towers.

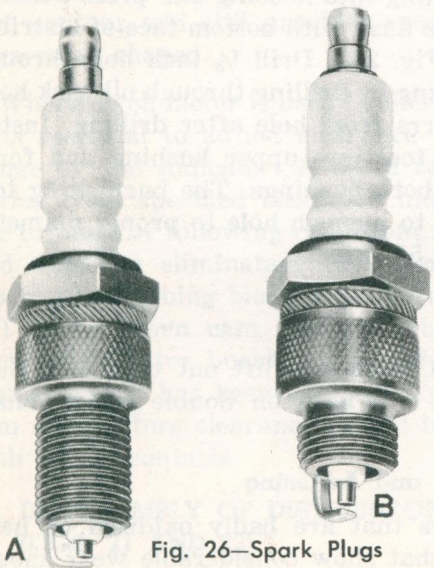


Fig. 26—Spark Plugs
a. Spitfire
b. Firepower

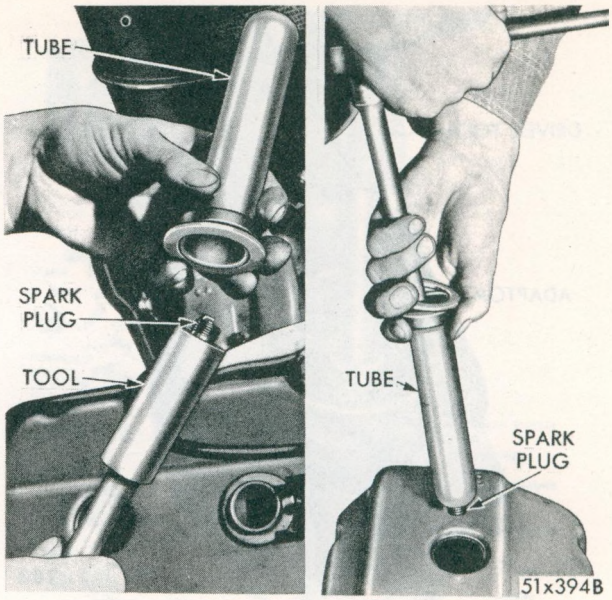


Fig. 27—Removing and Installing Spark Plugs

b. Distributor Cap and Rotor

Inspect cap for cracks and clean corrosion from towers. Inspect electrodes for excessive burning. Inspect rotor for cracks and burned tip. Inspect brush spring for distortion and be sure carbon brush moves freely in cap. Push cables all the way into towers.

47. IGNITION COIL

Clean oil and dust from coil. Clean corrosion from secondary tower and push cable all the way in. Be sure primary leads are connected to proper primary terminals according to polarity markings. The coil is designed to operate with a ballast resistor. The resistor is mounted on the coil bracket and must be included with coil when making a test of primary output. Coils that are tested without resistor will appear to be defective.

Check coil for external leaks and arcing. Always make two tests when checking coil. One when coil is cold, the other after coil has warmed up. The ballast resistor and coil must be tested together for output. To check the high tension circuit, pull secondary cable out of distributor cap. Hold end of cable about ¼ of an inch away from cylinder head and crank engine with engine ignition switch on. If spark jumps ¼ inch gap, coil can be considered satisfactory.

LIGHTING SYSTEM

48. HEADLIGHT AIMING AND ADJUSTMENT

a. Single Headlight Aiming

Place car on level surface with screen 25 feet ahead of headlight lenses. The screen (or wall) should be painted a light color. The horizontal line on screen should be 2 inches below center line of headlights (Fig. 28). The center vertical line should be equi-distant from two outer lines which represent vertical center of headlights.

b. Single Headlight Adjustment

The Sealed-Beam is adjusted vertically by adjusting screw at top, and horizontally by adjusting screw at side of headlight (Fig. 29). Adjust light beams by following pattern shown in Fig. 28. Adjustment should be made with high beam turned **on.**

c. Dual Headlight Aiming

The dual headlight system has **two** 5¾ inch Sealed Beams on each side of the front of the vehicle. (Fig. 30).

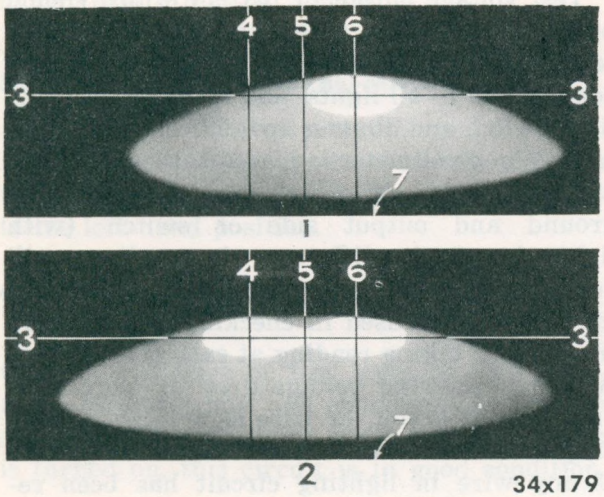


Fig. 28—Pattern of Properly Aimed Headlight

1. Upper beam of right headlight
2. Upper beam of both headlights
3. Horizontal line 2 inches below headlight centers
4. Vertical line, in line with center of left headlight
5. Vertical line, in line with windshield center strip and radiator ornament
6. Vertical line, in line with center of right headlight
7. Floor level

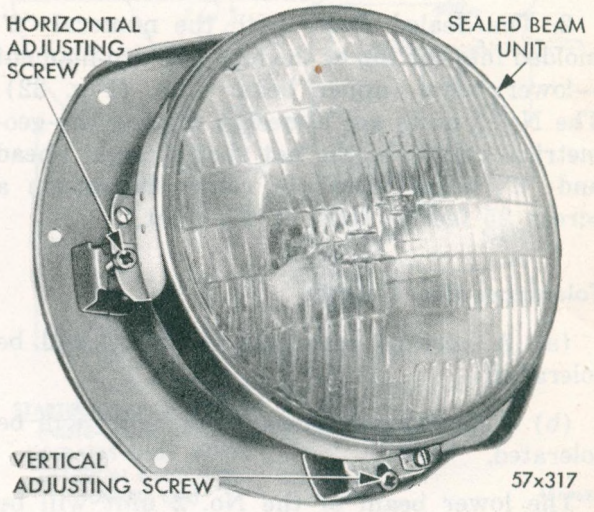


Fig. 29—Single Headlight Adjusting

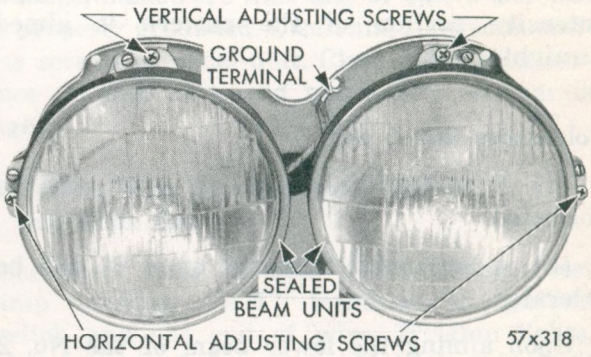


Fig. 30—Dual Headlight Adjusting

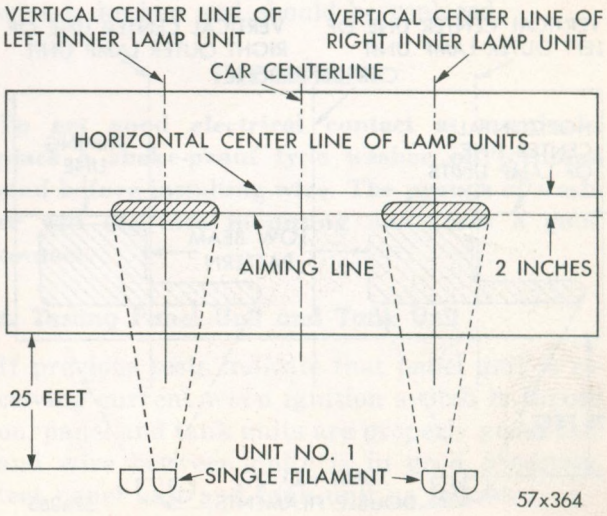


Fig. 31—Unit No. 1 Upper Beam Unit

1. The Sealed Beam with the numeral "1" molded into the top of the lens is a single filament—upper beam unit (Fig. 31).

2. The Sealed Beam with the numeral "2" molded into the top of the lens is a two-filament —lower beam—upper beam unit. (Fig. 32). The No. 1 units are aimed by aiming the geometrical center of the hot spot straight ahead and "2" below headlight center height on a screen 25 feet in front of the light.

Tolerances (No. 1 units)

(a) A vertical tolerance of ± 2″ will be tolerated.

(b) A horizontal tolerance of ± 6″ will be tolerated.

The lower beam of the No. 2 unit will be aimed so that the top edge of the high intensity portion of the pattern is aimed at the level of the lamp center and the left edge of the high intensity portion of the pattern is aimed straight ahead.

Tolerances (No. 2 unit)

(a) A vertical tolerance of ± 2″ will be tolerated.

(b) A horizontal tolerance of ± 6″ will be tolerated.

Upon aiming the lower beam of the No. 2 unit, the upper beam of the No. 2 unit will be automatically aimed.

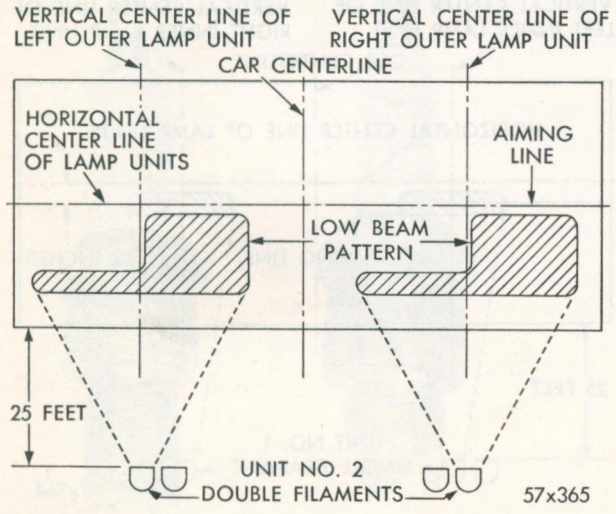


Fig. 32—Unit No. 2 Lower Beam—Upper Beam Unit

d. Dual Headlight Adjustment

Vertical adjustment screws are located at top of lights—horizontal adjustment screws are located at side of lights, as shown in Figure 30.

49. TESTING VOLTAGE AT HEADLIGHTS

One of factors affecting lighting efficiency is loss of voltage to light bulbs due to high resistance in circuit. Headlight voltage must be measured with lights burning and battery in fully-charged condition.

Remove headlight rim and, with Sealed-Beam unit partially removed from its mounting seat, attach leads of reliable voltmeter to prongs of Sealed-Beam unit while it is still inserted in connector socket. With Sealed-Beam unit in its correct position, top prong supplies current for low (traffic) beam. One of the side prongs supplies current for high beam and the other is ground connection.

With only lights burning, engine warmed up and running at speed equivalent to car speed of about 20 m.p.h., voltage at headlights should be not less than 13.25 volts, or more than 14.5 volts (with battery and generator at room temperature, approximately 70 degrees F.). If voltage is low at either headlight socket (with only standard equipment in the circuit), proceed as follows:

Test voltage output of battery which should be 12 to 12.5 volts. Clean and tighten battery terminals and ground cable. Check wires and connections to all lights, and check main headlight switch and dimmer switch for high resistance. When voltmeter is placed between ground and input side of switch and then between ground and output side of switch (with lights burning), difference in readings will represent the voltage drop in switch. The same method may be used in checking voltage drop in wires by taking reading at each end of wire. A switch showing voltage drop of more than one-tenth of a volt, or wire showing a voltage drop of one-tenth of a volt should be replaced. If any wire in lighting circuit has been replaced with other than standard equipment wire, it may lack capacity and cause voltage drop. The most important wire in entire primary circuit is wire that is connected from starter switch to ammeter, because it must carry full load of all branching circuits.

50. CIRCUIT BREAKERS

The Headlight circuit breaker (20 amperes) is on back of light switch, and the Windshield Wiper circuit breaker (6 amperes) is on back of wiper switch on Imperial Models and on bracket behind clock of the C-75, C-76 Models. The Convertible Coupe Top Lift circuit breaker (25 amperes) is on top light switch.

The Rear Compartment Cigar Lighter circuit breaker is 8 amperes on Four Door Sedans and Convertible Coupes, and the window lift circuit breaker, is 20 amperes. They are located behind left front kick panel on side cowl. The Seat Lift circuit breaker (40 amperes) is behind left kick panel on side of cowl.

51. DESCRIPTION AND OPERATION OF FUEL GAUGES

The fuel gauge system incorporates an electro-magnetic unit on all models. The system is connected to battery through ignition switch. The gauges operate only when ignition switch is in "Accessory" or "ON" position (Fig. 33).

A single wire connects electro-magnet and tank unit, and the tank unit case is grounded. As fuel in tank moves from "full" to "empty", a change in magnetic field surrounding variable field magnet (Fig. 33) takes place. This change in the magnetic field causes the gauge hand indicating the amount of fuel in the tank to move from "full" to "empty".

52. TESTING THE ELECTRO-MAGNETIC FUEL GAUGE

For following tests, ignition switch must be turned counter-clockwise to "Accessory", or extreme left hand position.

a. Testing Wire from Ignition Switch to Panel Unit

Connect one wire of test lamp to "SW" terminal on panel unit and connect other wire to a ground. If lamp lights when ignition switch is turned on, this circuit is in good condition.

b. Testing Panel and Tank Units for Ground

The panel unit and tank unit must have good grounds to operate properly. Use jumper wire to temporarily ground each unit at case. If gauge reading changes when temporary ground

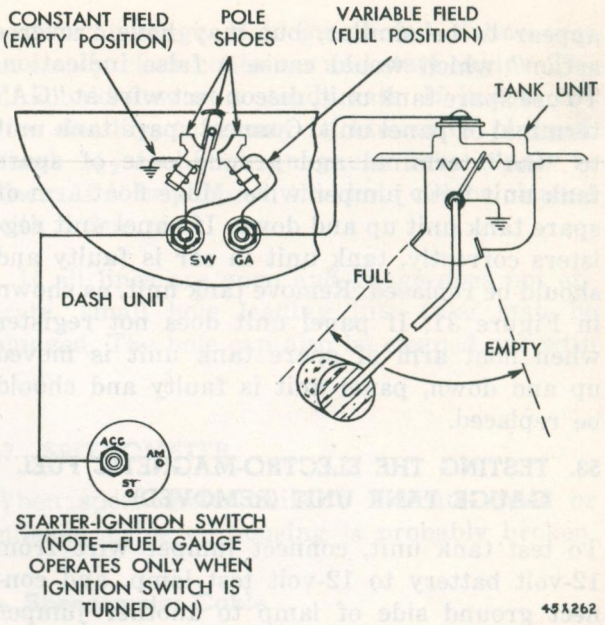


Fig. 33—Electro Magnetic Fuel Gauge Circuit

is made, make sure that case of unit under test is properly grounded. Clean and tighten mounting screws of panel unit. Clean contacting surface of tank unit, and make sure retainer is tight.

c. Testing Wire Between Panel Unit and Tank Unit

Disconnect wire at both ends. Connect test lamp between "AM" terminal of ignition switch and one end of wire. If lamp lights, wire is grounded and should be repaired. If lamp does not light, ground opposite end of wire. The lamp should light; if it does not, the wire is broken and should be replaced.

IMPORTANT

To get good electrical contact at terminals, place a shake-proof type washer on terminal stud before installing wire. The prongs of washer will dig into mounting and form a good contact.

d. Testing Panel Unit and Tank Unit

If previous tests indicate that panel unit is receiving current when ignition switch is turned on, panel and tank units are properly grounded, and wire between units is in good condition, test panel unit and tank unit as follows:

Use spare tank unit that is in good condition and same type. Some types of tank units may

appear to be similar, but may have "reverse action" which would cause a false indication. To use spare tank unit, disconnect wire at "GA" terminal of panel unit. Connect spare tank unit to "GA" terminal and ground case of spare tank unit with jumper wire. Move float arm of spare tank unit up and down. If panel unit registers correctly, tank unit in car is faulty and should be replaced. Remove tank unit, as shown in Figure 31. If panel unit does not register when float arm of spare tank unit is moved up and down, panel unit is faulty and should be replaced.

53. TESTING THE ELECTRO-MAGNETIC FUEL GAUGE TANK UNIT (REMOVED)

To test tank unit, connect jumper wire from 12-volt battery to 12-volt test lamp, and connect ground side of lamp to another jumper wire leading to tank unit terminal. Connect another jumper wire from tank unit case to other side of battery. With float in "full" position, lamp should light at almost full brilliance. When float is lowered, light in lamp should steadily decrease in brightness until it will just barely glow in a reasonably dark room.

This test will show whether or not tank unit is operating properly; but, it will not indicate exact calibration. If contact wiper does not contact wire cone resistor, the gauge will not function. In most cases of tank unit failure, unit should be replaced (Fig. 34). When installing unit in tank, do not bend float arm. Make sure that gasket is properly positioned and tighten lock ring.

54. ELECTRIC TEMPERATURE GAUGE

The electric (or magnetic) temperature gauge consists of two units, dash unit and engine unit. The gauge is connected to source of voltage through ignition switch.

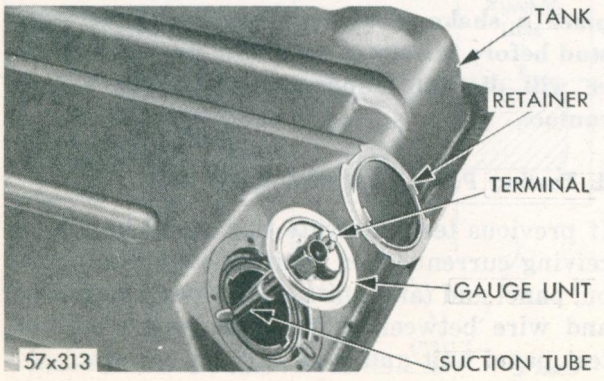


Fig. 34—Removing and Installing Fuel Gauge (Tank Unit)

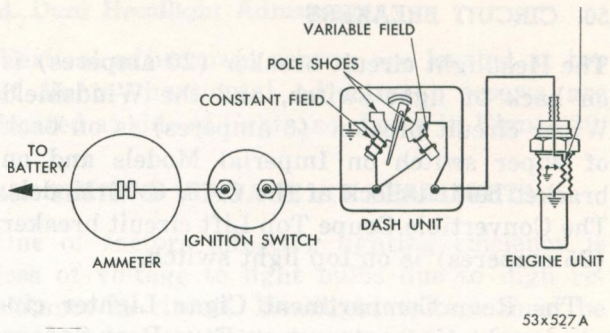


Fig. 35—Electric Temperature Gauge

a. Dash Unit

The dash unit (Fig. 35) has two magnetic poles. One of windings is connected to ignition switch and to ground. The other winding in dash unit connects to ground through engine unit.

b. Engine Unit

The engine unit changes resistance as its temperature varies causing a corresponding change in the strength of the variable field in the dash unit.

55. TESTING THE ELECTRIC TEMPERATURE GAUGE CIRCUIT

a. Test 1

Disconnect wire at engine unit and turn on ignition. The gauge hand should stay against left side stop pin.

b. Test 2

Ground wire disconnected from engine unit and turn on ignition. The gauge hand should swing across dial to right side stop pin.

c. Test Results and Corrective Measures

Item 1—If gauge hand does not stay on left hand stop pin in Test 1, wire is grounded between dash unit and engine unit, or dash unit is defective. Test further by disconnecting wire at dash unit "GA" terminal and turn on ignition switch. If gauge hand now stays on left hand stop pin, replace wire. But, if gauge hand still moves, replace dash unit.

Item 2—If gauge hand does not swing across dial in Test 2, there is an open circuit in wire between dash unit and engine unit, dash unit is defective, or no power is reaching dash unit. Test further by grounding "GA" terminal on dash unit and turning on ignition switch. If gauge hand now moves, replace wire. If gauge hand still does not move, connect 12-volt test lamp from dash unit ignition terminal to ground. Turn on ignition switch. The test lamp should light. If test lamp lights, replace dash unit. But, if test lamp does not light, test wire between ignition switch and dash unit by connecting test lamp to "Accessory" terminal at ignition switch and to ground. When this is done, test lamp should light.

Item 3—If gauge hand operates correctly in Test 1 and Test 2, but gauge does not indicate temperature changes correctly, engine unit is defective, or dash unit is not calibrated properly. Use an engine unit that is in good condition. Then, if gauge is still not accurate, replace dash unit.

Item 4—If gauge hand is at right hand stop pin (maximum) at all times, and Test 1 and Test 2 indicate that wiring and dash unit are in good condition, the engine unit is defective. Install new engine unit. If gauge hand will not move, dash unit is damaged or incorrectly installed. Install unit correctly, or replace as necessary.

56. TESTING THE OIL PRESSURE GAUGE

Test oil pressure gauge by hooking up an accurate gauge and comparing readings. The hook up can be made by using "Tee" fitting at flexible hose connection. Warm up engine and compare readings for idle and normal driving pressures.

Be sure that oil level is checked before making this check. An oil gauge pointer that flutters is usually an indication that oil has entered oil tube connecting gauge to engine block. The tube should have air in it to cushion pulsations of oil pump and oil relief valve. The fluttering pointer may be result of leak in oil gauge tube or due to improper installation. To correct this condition, disconnect tubing at gauge and engine block and drain out oil. Connect tubing at gauge first and then at block.

Test for possible plugging by breaking connection at gauge. Hold gauge end of line over an empty, clean container and start engine. The oil should flow at a steady rate. If it does not flow steadily, tube may be kinked or plugged. Check $\frac{1}{32}$ inch hole in gauge tube nipple in block. If it is plugged, this hole can be cleaned with a fine pin.

If oil lines are open and gauge does not operate, small hole leading into tube may be plugged. The hole can also be cleaned out with a pin.

57. SPEEDOMETER

When speedometer fails to indicate speed or mileage, cable or housing is probably broken.

a. Speedometer Cable

Most cables are broken due to lack of lubrication, a sharp bend or kink in housing. A cable may break if speedometer head mechanism binds. If such is the case, speedometer head should be repaired or replaced before new cable or housing is installed.

A "jumpy" pointer condition (together with a sort of scraping noise) is due, in most instances, to dry or kinked speedometer cable. The kinked cable rubs on housing and winds up, slowing down pointer. The cable then unwinds and the pointer "jumps". To check for kinks, remove cable, lay it on flat surface, and twist one end with fingers. If it turns over smoothly, the cable is not kinked. But, if part of cable flops over as it is twisted, cable is kinked and should be replaced.

b. Lubricating Speedometer Cable

The speedometer cable should be lubricated with MOPAR All-Weather Speedometer Cable Lubricant every 10,000 miles. At the same time, put in a few drops of MOPAR Speedometer Oil on wick in speedometer head. Refer to Section XV, "Lubrication."

Fill ferrule on upper end of housing with MOPAR Speedometer Cable Lubricant. Insert cable in housing, starting at upper end. Turn cable around carefully while feeding it into housing. Repeat filling ferrule except for last six inches of cable. Too much lubricant at this point may cause lubricant to work into indicating head.

c. Installation of Speedometer Cable

If cable sticks when it is inserted into housing and will not pass through it, interior of housing is damaged or kinked. Be sure to check housing from one end to other. Straighten sharp bends by relocating clamps or elbows. Replace housing if it is badly kinked or broken. Position cable and housing so that they lead into head as straight as possible.

58. AMMETER

The ammeter shows only current flowing to or from battery, as case may be, and does not indicate entire generator output. The current supplied for ignition, lights and accessories is automatically deducted from generator output reading. Because of this, the ammeter should never be used as an accurate check for generator current output. Ammeter should not indicate more than 10 ampere charge above 30 miles per hour, after first 30 minutes of continuous driving. If more than a 10 ampere charge is indicated with a battery specific gravity of 1.260 or higher, check voltage control regulator.

SWITCHES

59. IGNITION STARTER SWITCH (STANDARD TRANSMISSION)

The following precautions must be followed when installing accessories such as heaters, radio, spot-light, etc. Use accessory terminal **only** on ignition switch and **not** the ammeter terminal post.

a. Starter Switch (Torque-Flite Transmission —Only)

The starter switch is mounted on the push button box and is actuated by the neutral push button as shown in Figure 3.

b. Vacuum Switch is located on Engine Intake Manifold (Fig. 3).

c. Neutral Switch is located on outside of Torque-Flite transmission.

60. REMOVAL AND INSTALLATION OF IGNITION LOCK CYLINDER

NOTE: Remove battery ground cable before removing ignition lock cylinder.

To remove ignition lock cylinder, turn ignition key clockwise to "on" position, and loosen set screw holding switch in instrument panel. Pull switch assembly out from instrument panel toward firewall far enough to allow lock cylinder locking pin to clear instrument panel. With ignition key in "on" position, use pointed punch to push in on cylinder locking pin, while pulling on cylinder. Remove ignition lock cylinder. To install lock cylinder in switch, line up locking pin with slot in switch housing. Press in on cylinder lock assembly. Install switch in instrument panel and tighten locking screw.

61. WINDSHIELD WIPER SWITCH

The windshield wiper switch has a 6 ampere circuit breaker for circuit protection. The armature resistor, windshield wiper, parking and battery terminals are located on outside of switch.

62. HEADLIGHT SWITCH (FIG. 36)

The headlight and panel light switches are combined into one unit, but are operated by separate controls. On all models, switch (or switches) is held in instrument panel by a threaded sleeve and hex nut. The panel light switch control encircles inner headlight switch and is indexed on its shaft by lugs in tab plate and slots in shaft. The headlight switch knob is held on its shaft by a recessed hex screw. If a switch is unoperative or defective, replace complete unit.

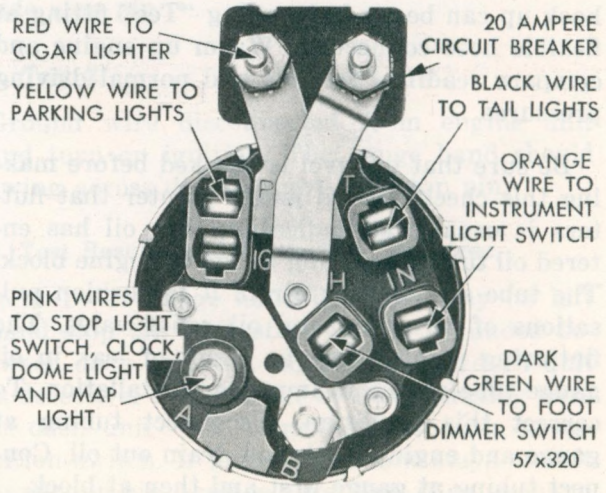


Fig. 36—Headlight Switch (Rear View)

HORNS

Three makes of horns are used. Sparton, Auto-Lite, and Jubilee. The horn circuits are tested in the same manner for all three makes. The tone adjustment however, is different for each type. The horn relay is electrically connected to ignition switch and does not operate when switch is in "OFF" position.

63. TESTING HORN CIRCUITS

When horns fail to blow, test circuit as follows. Touch jumper wire from Relay "SW" terminal to ground. If horn blows, it is an indication that trouble is in wire from "SW" terminal to horn button, or in horn button contact ring. If horns do not blow, connect jumper from "B" terminal to "H" terminal. If horns operate, relay is defective. If horns do not blow, trouble is in wire to horns, in horns, or in the wire from starter relay to horn relay "B" terminal.

64. SERVICING THE HORNS

a. Adjusting the Sparton Horns

Pry cover from horn. Remove contact adapter, turn adjusting nut counter-clockwise (Fig. 37) until there is no vibration. Turn adjusting nut clockwise approximately ¼ turn, or until tone has clear, mellow sound.

b. Adjusting the Auto-Lite Horns

Pry cover retaining clips up, and remove cover. Loosen lock nut and turn adjusting screw (Fig. 38) clockwise until vibration stops. Then, turn adjusting screw back counter-clockwise, approximately ¼ turn until tone is clear and mellow, and tighten lock nut.

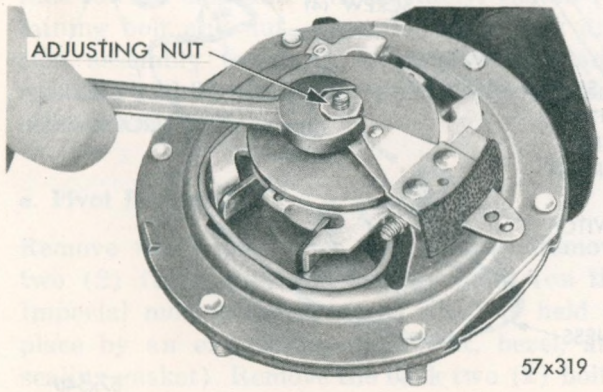


Fig. 37—Adjusting (Sparton) Horn

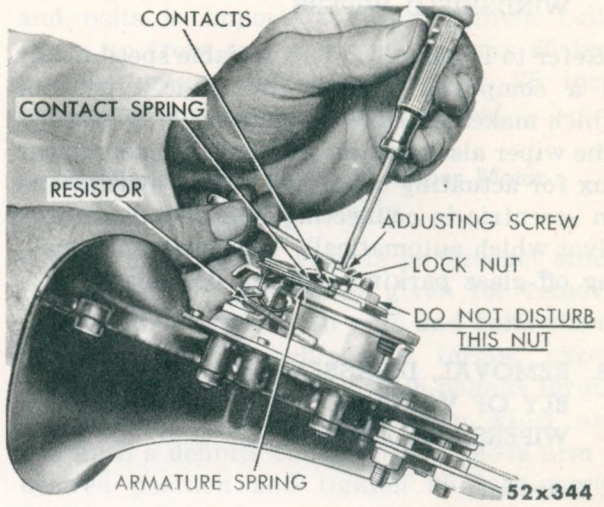


Fig. 38—Adjusting (Auto-Lite) Horn

c. Adjusting the Jubilee Horn (High and Low)

To adjust Jubilee horn tone, connect test ammeter between positive post of 12-volt battery and horn terminal post. Connect jumper lead from negative battery post to horn base. Observe test ammeter and rotate adjusting screw (Fig. 39) to right or left to obtain reading of 8 or 9 amperes at 12.4 volts. Tighten adjusting screw lock nut.

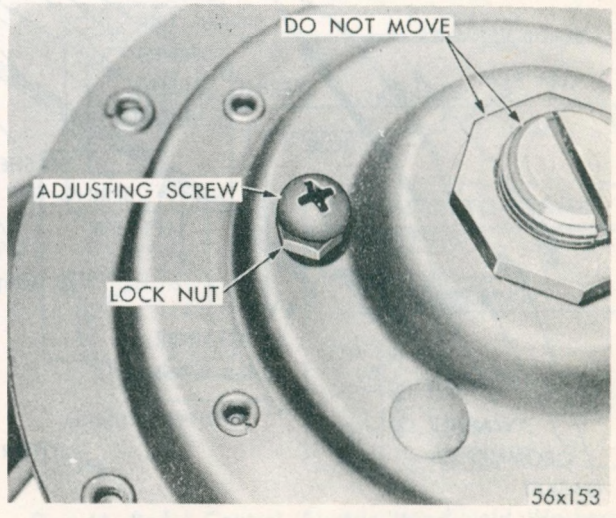


Fig. 39—Adjusting (Jubilee) Horn

WINDSHIELD WIPERS

65. VARIABLE SPEED, OFF-GLASS PARKING WINDSHIELD WIPERS

(Refer to Figure 40). The variable speed motor is a compound wound, reversible type unit which makes possible off-glass parking feature. The wiper also contains a Geneva Wheel in gear box for actuating off-glass parking switch, and an eccentric in connecting link at wiper crank pivot which automatically lengthens links making off-glass parking position possible.

66. REMOVAL, DISASSEMBLY AND ASSEMBLY OF VARIABLE SPEED WINDSHIELD WIPERS (Fig. 40).

a. Removal

To facilitate assembly or disassembly of eccentrics at the motor crank and link ends, remove windshield wiper assembly as a unit whenever wiper or links are to be serviced.

I. **Cars that are not equipped with heater and defroster ducts:** Disconnect the wiper leads at switch. Disconnect wiper links at pivot cranks by removing clips and brass washer. Remove three (3) nuts which hold the large wiper motor bracket to firewall. The complete unit may now be removed by moving the bracket back far enough to clear the studs and lowering unit down from under instrument panel.

NOTE: Care should be taken not to bend the links and battery should be disconnected to eliminate the possibility of shorts.

II. **Cars equipped with Heater and Defroster ducts.** Remove glove box and door. If car is equipped with a radio that removes from front of instrument panel, time will be saved by removing it. Disconnect wiper leads from the switch. Disconnect links from pivot cranks by removing clip and washer. While holding unit in place, remove four (4) self-tapping stud bolt assemblies from motor plate to motor bracket which is attached to firewall. The unit may now be moved horizontally towards passenger side and then down from under instrument panel. The motor bracket can be removed by taking off three attaching nuts and bringing it straight down after clearing the studs.

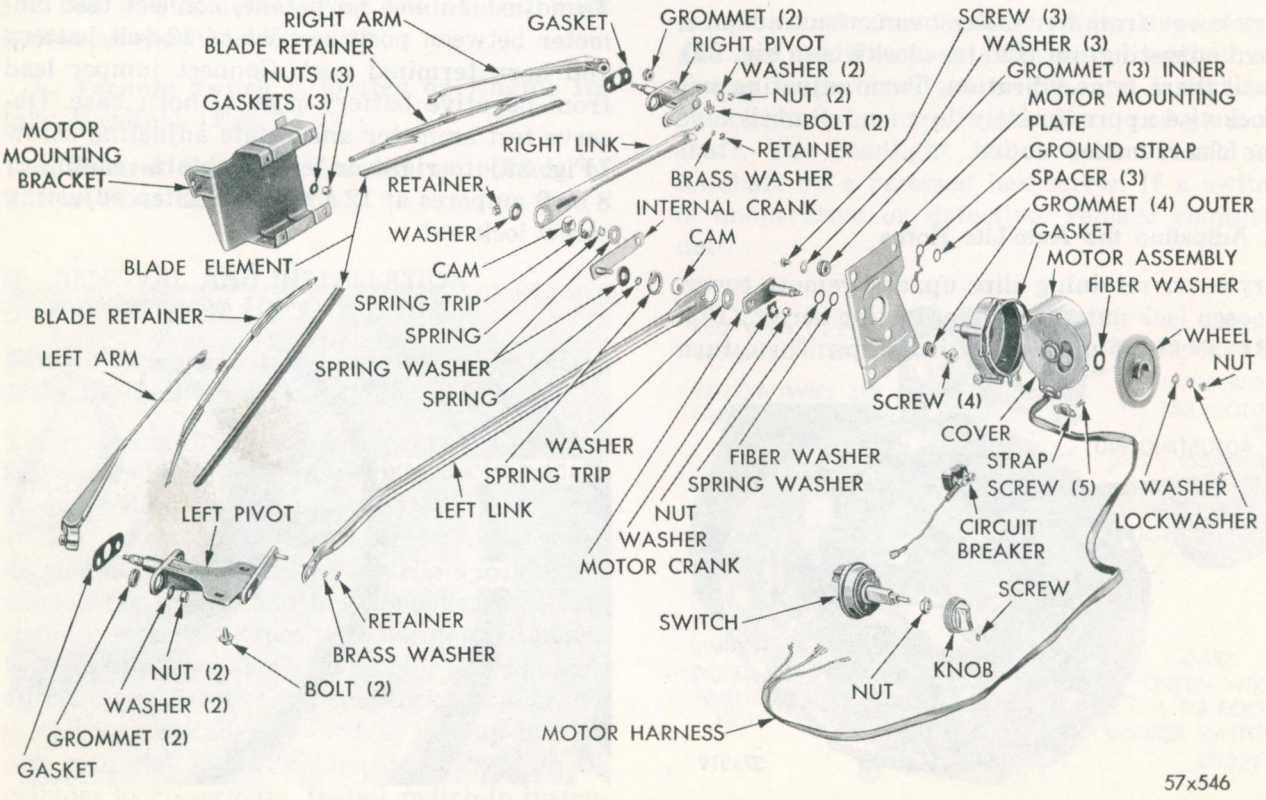


Fig. 40—Windshield Wipers (Disassembled)

b. Disassembly of Windshield Wiper Link (Fig. 40)

With motor and link assembly laying on clean bench, remove clip that holds right-hand link to crank arm. Remove bevel washers, and carefully remove link. The pivot end of link is provided with a stop to prevent wipers from going over center and locking. Remove parking cam and spring release. Remove coil spring from around pin by spreading the springs ends apart, and remove spring washer. The left-hand link is disassembled in same manner, after removing crank arm to crank lever retaining nut. To replace wiper switch or Geneva Wheel remove switch plate.

c. Assembly of Motor Switch

Make sure gear box contains lubricant. Install switch plate. Be sure Geneva Wheel follower pin engages smoothly with top of gear.

d. Assembly of Windshield Wiper Link

Install spring washer, with concave surface toward crank arm. Expand ends of crank pin coil spring and install on crank pin. Install spring release.

NOTE: The spring releases are identical but must be installed in accordance with the following letter code; looking directly at the crank, the spring release, and the link, have the same code letter visible.

Install parking cam so that it will index with spring release, and engage ends of spring between release and parking cam in openings at point of index. Install washer with convex surface toward cam and link assembly. Install retaining bolt and nut. Assemble right link and cam assembly to crank lever pivot in same manner, locking in place with a clip instead of retaining bolt.

e. Pivot Removal

Remove the wiper arms and blades. Remove two (2) front stud and washer bolts (on the Imperial models the front of pivot is held in place by an exterior spanner nut, bezel, and sealing gasket). Remove the back two (2) bolts. The pivot can now be removed from inside of car.

f. Installing New Pivot

Install new gasket and pivot. The use and proper installation of Belleville Type washers and bolts is important. Hand tighten bolts. Draw up front two nuts and washers 65 inch pounds torque, tighten back bolts, 75 inch-pounds torque, to insure a good seal.

g. Installation of Windshield Wiper Motor Bracket and Link Assembly

Install three rubber gaskets on bracket studs. Reinstall in reverse order given for removal in preceding section. All nuts and bolts should be tightened 75 inch-pounds torque, except wiper arm is tightened 85 inch-pounds torque. To readjust wiper arms: Loosen wiper arm nut until a definite click is heard. Move arm to desired position and tighten 85 inch-pounds torque.

NOTE: All wiper arms are capable of infinite adjustment with respect to the pivot shaft.

h. Switch Color Code

Red Lead—field lead—switch terminal F-1.

Yellow Lead—field lead—switch terminal F-2.

Black Lead—armature lead—switch terminal "A".

Blue Lead—Park Lead—switch terminal "P".

Heavy Lead—hot lead from battery—connect to circuit breaker.

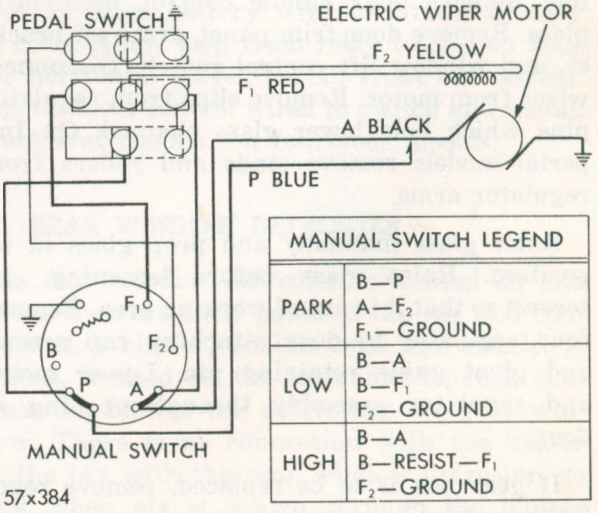


Fig. 41—Pedal Control—Electric Windshield Washer—Wiring Diagram

67. PUSH PEDAL CONTROL

When the pedal is depressed, a stream of washer fluid will spray the windshield, also the windshield wipers will start to operate as long as the pedal is depressed. The electrical pedal control is standard on Models C-76 and all Imperial Models. It is optional equipment on the C-75 Models. Figure 41 shows the wiring diagram.

ELECTRIC WINDOW LIFTS

The three component parts in basic circuit are circuit breaker, motor, and switch. There is no relay, and switch carries full amperage load of motor.

The power window lift motors have an individual, built-in circuit breaker. All models, except four door special, use one 20 amp. circuit breaker on left cowl side to protect wiring to both front and rear motors. The four door special uses one 30 amp. circuit breaker for same purpose. Four switches are used to control window lifts—a master switch located on left front door, and an individual door switch for each of other doors. The individual switch feeds are brought out to circuit breaker on cowl side. The harness for right door is carried across upper firewall. The motors require no lubrication.

When operating a window, normal amperage draw is 12 to 16 amperes for all cars, except rear doors of four door Nassau, Newport and St. Regis models which draw approximately 18 to 22 ampere. This will vary with voltage.

68. REMOVAL OF WINDOW LIFT

Disconnect battery and remove garnish molding. Remove door handle control, escutcheon plate. Remove door trim panel, arm rest bracket, and window lift control switch. Disconnect wires from motor. Remove clips from regulator pins which hold lower glass channel. On Imperial models remove studs and rollers from regulator arms.

Raise glass manually and prop glass in up position. Raise glass before loosening cap screws so that it is out of working area. Remove four regulator to door attaching cap screws and pivot guide retaining pin. Lower motor and regulator assembly through opening in door.

If gear box is to be replaced, remove regulator counter-balance spring before removing unit. The counter-balance spring has approximately 360 degrees of wrap.

CAUTION

Use large pair of pliers when removing. Be sure to remove spring before disassembling gear box.

The gear box, which is replaced as an assembly, consists of worm and worm gear. The worm gear drives a pinion which is meshed with regulator sector gear. The gear box is lubricated at assembly and should not require further lubrication. Use MOPAR Lubriplate, 105 light-weight on all other moving parts.

69. INSTALLATION OF WINDOW LIFT

Place motor and regulator assembly through opening in door and insert intermediate pivot arm pin into guide inside of door shell. There is no clip. Install four regulator attaching screws, finger tight.

After installing regulator retaining screws, check to make certain that intermediate pivot arm did not slip out of guide during installation. Remove window prop and lower glass. Insert control arms into glass channel, using leather washer on each side of channel, and secure with clip. On Imperial Models, install rollers and pins in regulator arms. The control arms can be inserted into glass channel only when glass is in lowered position.

Connect wires to motor and connect battery. On Hard-Top Models—adjust regulator in slotted holes. Allowing both pins to contact glass channel when glass frame is flush with vent wing. On Sedan—adjust regulator so that glass runs free in channel. Check glass for alignment. Connect an ammeter into electrical circuit and operate window. The ammeter reading should be constant without fluctuation as follows: Approximately 14 amperes, all models except rear doors of four-door Nassau, Newport and St. Regis models. If ammeter reading fluctuates, there is a bind in glass or in linkage. The down stop should be adjusted so window is flush with garnish molding, and other parts.

POWER SEATS

The power seat can be moved six ways—forward, backward, upward and downward and tilt. (Refer to Fig. 42). The power seat is driven by one motor located under front seat.

The motor operates a gear drive train which supplies power through flexible cables to the slave units located in the seat track. The control switch assembly is on left side of front seat and is wired through a relay to a 40 ampere circuit breaker. This circuit breaker is located adjacent to window lift circuit breakers behind left front kick panel.

The wire from starter relay supplies power to circuit breaker. If car is also equipped with electric window lifts, power is supplied by a brass jumper parallel with electric window lift circuit breakers.

Power is supplied to relay from circuit breaker. Six wires go to switch. One used for power, two used for motor field current which also actuates relay for motor armature current. Three wires attach to solenoids which control movement of front riser, rear riser and horizontal movement. The wiring harness to motor is looped to permit up and down movement.

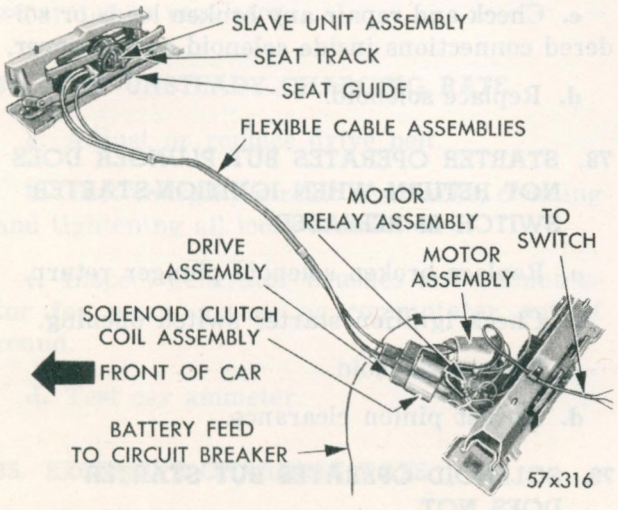


Fig. 42—Power Unit—Power Seat Assembly

The wire harness should be clipped securely so wires will not be pinched when track is in extreme forward position. The tracks are replaced **only** as an assembly, and are not interchangeable from left to right. Tracks cannot be adjusted. The horizontal travel is five inches and horizontal plane of seat track is inclined 11 degrees. Vertical travel is 2 inches at front and 2 inches at rear. Available tilt is 7½ degress forward and 8 degrees rearward from neutral.

70. REMOVAL AND INSTALLATION OF FRONT SEAT ASSEMBLY AND ADJUSTER

a. Removal

Remove front seat cushion—four-door only, and disconnect battery. Remove control wires from switch. Remove front seat assembly. On Hard-Top Models—remove front seat and cushion as an assembly. Remove nuts from seat guide attaching studs and remove adjuster from car.

NOTE: Do not damage flexible tubing during removal.

b. Installation

Install adjuster and attaching nuts. Connect seat adjuster battery wire to circuit breaker in cowl. Allow loop from relay to clip on floor for horizontal travel. Install front seat assembly. Connect control wires to switch and install front seat cushion on four-door models.

71. REAR WINDOW DEFROSTER

The rear window defroster is located on and under the rear shelf panel of the car and consists of a blower, flexible hose and nozzle. A switch, located on the instrument panel, controls the blower for defrosting the rear window. There is no connection with the heater in the car with the rear window defroster, so that when air is drawn through the blower from inside the car it is recirculated on the rear window glass.

SERVICE DIAGNOSIS
BATTERIES

72. BATTERY DISCHARGED

a. Charge battery by slow charging. Test circuit resistance and regulator.

b. Investigate use of accessories and type of driving car is subjected to.

c. Check for short circuits.

73. BATTERY DOES NOT RETAIN WATER

a. Check voltage regulator.

b. Check for broken case.

c. Reseal joints between cell covers and case.

74. BATTERY DOES NOT TAKE CHARGE

a. Add water to adjust electrolite to proper level.

b. Test battery capacity after 24 hours charge at four amperes.

c. Dissolve sulphated condition by charging at one ampere per positive plate per cell (or for 24 hours at four amperes) until charging rate does not rise for two successive readings taken at hourly intervals.

STARTERS

75. STARTER RELAY DOES NOT CLOSE

Check all relay, ignition-starter switch connections and neutral.

a. Replace open circuit wire between starter relay arm (or ground) terminal post and neutral switch (T.F. trans. only).

b. Replace open circuit wire between ignition-starter switch and ignition terminal on starter relay.

c. Replace neutral switch (TF trans. only).

d. Replace starter relay.

e. Replace ignition-starter switch.

f. Recharge battery.

76. RELAY OPERATES BUT SOLENOID DOES NOT

a. Replace open circuit wire between starter-relay solenoid terminal and solenoid actuating terminal post.

b. Check and clean up solenoid switch contacts.

c. Clean and tighten terminal connections on terminal bus bar between solenoid and starter fields.

d. Turn and under cut armature. Replace brushes.

e. Check for broken lead or loose soldered connection inside solenoid switch cover.

f. Replace solenoid.

g. Replace starter relay.

77. SOLENOID PLUNGER VIBRATES BACK AND FORTH WHEN SWITCH IS ENGAGED

a. Recharge battery. Replace defective battery. Clean and tighten cable connections.

b. Check for loose connections at relay, ignition starter switch and solenoid.

c. Check and repair any broken leads or soldered connections inside solenoid switch cover.

d. Replace solenoid.

78. STARTER OPERATES BUT PLUNGER DOES NOT RETURN WHEN IGNITION-STARTER SWITCH IS RELEASED

a. Replace broken solenoid plunger return.

b. Check ignition starter switch opening.

c. Replace solenoid.

d. Adjust pinion clearance.

79. SOLENOID OPERATES BUT STARTER DOES NOT

a. Recharge or replace battery.

b. Clean and tighten cable connections.

c. Check solenoid switch for closing (contacts jumper).

d. Adjust pinion clearance with plunger adjusting screw, with starter on bench.

e. Repair starter.

80. STARTER FAILS AND LIGHTS DIM

a. Recharge or replace battery.

b. Clean and tighten cable connections.

c. Check brush pigtails and coil leads for grounds.

d. Replace grounded starter fields.

e. Check for armature rubbing on field poles.

81. STARTER ARMATURE ROTATES BUT PINION DOES NOT ENGAGE

a. Check arm shaft for rusting.

b. Replace starter drive and adjust pinion clearance.

c. Check solenoid plunger linkage.

d. Replace engine flywheel ring gear if bad.

82. STARTER PINION JAMS IN RING GEAR

a. Replace drive. Replace flywheel ring gear. Tighten starter mounting bolts securely when replacing starter.

b. Armature shaft bent. Replace armature and check pinion and flywheel teeth.

GENERATORS

83. GENERATOR FAILS TO CHARGE

a. Ground generator field terminal with engine running at 1500 R.P.M. If it still fails to charge, remove generator and repair. If generator charges with field grounded, remove regulator, clean and adjust contacts or replace regulator.

b. Test for open circuit in field lead from generator to regulator.

c. Test for grounded armature lead from generator to regulator.

84. LOW UNSTEADY CHARGING RATE

a. Adjust or replace drive belt.

b. Test charging circuit resistance, cleaning and tightening all loose connections.

c. Inspect generator brushes and commutator for wear, grease or commutator out of round.

d. Test car ammeter.

85. EXCESSIVE CHARGING RATE

a. Check regulator contacts for sticking and for high setting of voltage regulator.

b. Check for grounded field lead between generator and regulator or for grounded field terminal post by disconnecting field lead at regulator with engine running at 1200 R.P.M. This should cause generator to quit charging if it does, regulator field circuit is grounded or contacts stuck. If charge stops with field open; disconnect field lead at generator. If charge stops, field lead is grounded, if not, remove generator and repair ground in generator field terminal post or field lead to post.

86. NOISY GENERATOR

a. Check pulley alignment.

b. Check for electrical noise by grounding armature terminal; if noise stops remove generator and inspect commutator and brushes.

c. Inspect bearing for wear or roughness.

d. Tighten pole shoe screws.

87. PREMATURE FAILURE OF ARMATURE

a. Test regulator.

b. Test for shorted cell in battery by using capacity test.

REGULATORS

88. REGULATOR CONTACTS OXIDIZED

a. Check resistance of ground circuit.

b. Check field coils for short circuit.

c. Check for misalignment or improper air gap adjustment of regulator contacts.

89. REGULATOR CONTACTS PITTED

a. File contacts. Reset air gaps and adjust regulator setting to specifications.

b. Check battery for proper ground polarity (negative post grounded). Clean and adjust contacts and reset output to specifications.

c. Wrong regulator polarity. Replace regulator.

90. BURNED COIL WINDINGS

a. Replace regulator after checking for high voltage regulator setting.

b. Check for grounded field circuit. Repair ground and replace regulator.

91. BURNED CONTACT ARM

a. Replace regulator and connect wires to proper terminal.

b. Never short between the battery lead and the regulator field terminal. If this is done accidentally clean contacts and adjust regulator.

92. REGULATOR CONTACTS STUCK

a. Reset air gaps and adjust settings. Replace regulator if contacts are badly burned or pitted.

b. Check battery polarity (negative ground). Remove field lead from regulator and touch battery lead to polarize generator after battery is properly installed.

c. Install regulator of proper polarity. A negative ground regulator has NEG stamped on base.

IGNITION

93. BURNED CONTACTS

a. File contacts that are not excessively burned. Align contacts and adjust gap to specifications. Adjust breaker arm spring tension.

b. Replace contacts that are badly burned. Check for presence of oil or grease on and around contacts; eliminate cause if present. Check voltage regulator. Check condenser.

94. PITTED CONTACTS

a. Replace condenser with one of proper capacity.

95. FOULED SPARK PLUGS

a. Check plugs for proper heat range.

b. Eliminate excessive oil consumption.

c. Check carburetor for rich mixture.

d. Adjust gaps to .035 inch.

96. BURNED SPARK PLUGS

a. Check for proper heat range.

b. Tighten plugs to specified torque, using new gaskets (engines so equipped).

c. Check voltage regulator setting.

d. Check carburetor for lean mixture.

e. Adjust ignition timing.

f. Check for leaking head gasket or cracked cylinder head.

97. DISTRIBUTOR CAP BLOWS OFF

a. Check for ruptured diaphragm in vacuum advance unit.

LIGHTING

98. LIGHTS BURN OUT

a. Replace damaged bulbs after adjusting voltage regulator.

99. LIGHTS DO NOT BURN

a. Test voltage at headlights and replace bulbs or repair wiring.

b. Replace or repair dimmer or light switch.

c. Recharge or replace battery and test generator and voltage regulator.

d. Test voltage drop of circuit. Clean and tighten all loose connections.

100. LIGHTS FLICKER

a. Test voltage drop of circuit. Clean and tighten all loose connections.

b. Test battery. Recharge or replace battery. Test voltage regulator.

c. Check bulb contacts for corrosion or being loose. Clean and tighten ground connections.

101. EXCESSIVE FLARE AT ACCELERATION

a. Recharge or replace battery.

b. Adjust voltage regulator.

c. Clean and tighten engine to body ground connection.

102. INTERMITTENT OPERATION OF HEADLIGHTS

a. Check circuit breaker.

b. Test voltage drop of circuit. Clean and tighten all loose connections. Replace defective dimmer or headlight switch.

FUEL GAUGE

103. GAUGE POINTER STICKS AT EMPTY MARK

a. Clean paint from indicator pointer where it contacts empty stop.

104. GAUGE POINTER DOES NOT MOVE TO FULL MARK (FULL TANK)

a. Clean and tighten loose connections, in fuel system electrical circuit.

b. Check tank unit for good ground connection.

c. Check tank to frame ground connection.

d. Check tank unit for open coil. Replace tank unit.

e. Replace dash unit.

105. GAUGE POINTER FLICKERS

a. Clean and tighten all loose connections (including ground).

b. Check tank unit arm contact to rheostat.

106. GAUGE POINTER STAYS AT FULL

a. Check both dash and tank units for short circuit.

HORNS

107. HORNS DO NOT BLOW

a. Short from relay "SW" terminal to ground (IGN SW ON). If horns now blow repair wiring from "SW" terminal to horn contact ring.

b. Connect jumper relay IGN. terminal to B terminal and depress button. If horn blows repair wiring IGN. terminal to IGN. switch.

c. If horns do not blow after above tests, connect jumper from "B" to "H" terminal. If horns blow replace relay. If horns do not blow check wiring from battery to B terminal and H terminal to horn.

d. If horns still do not blow after tests above, repair or replace horns.

108. HORNS BLOW CONTINUOUSLY

a. Disconnect wire from relay "SW" terminal. If horns stop blowing check for ground in wiring from "SW" terminal to horn button, contact plate. If horns still blow when wire is removed from "SW" terminal, replace relay.

b. Check for grounded horn button.

WIPERS

109. WIPERS OPERATE SLOWLY

a. Replace brushes. Turn and undercut armature commutator.

b. Check for loose connections in ground and wiring circuit. Clean and tighten.

c. Free up and lubricate pivot shaft.

d. Replace control switch.

e. Replace motor.

110. WIPERS FAIL TO OPERATE

a. Free up and lubricate linkage.

b. Test control switch and wire from motor to switch by connecting jumper wire from ammeter to motor, and across switch terminals. (Refer to Figure 49).

c. Remove motor and test on bench.

111. WIPER BLADES NOT PARKING OFF GLASS

a. Repair or replace link spring.

b. Adjust parking switch plate on motor gear box.

112. BLADES CHATTER

a. Replace arm.

b. Install blades that have proper pressure.

113. MOTOR WILL NOT PARK

a. Check wiring and panel switch.

b. Install new parking switch.

c. Replace motor.

POWER WINDOWS

114. WINDOW DOES NOT OPERATE FROM MASTER SWITCH, BUT WILL FROM DOOR SWITCH

a. Replace wire between circuit breaker and master control switch.

b. Replace master control switch.

c. Replace broken wire at door containing master switch group.

115. WINDOW DOES NOT OPERATE FROM EITHER MASTER OR INDIVIDUAL SWITCH

a. Replace burned out motor and check for grounded sticking or defective switch.

b. Check voltage of circuit for broken wiring between circuit breaker and motor terminals.

c. Replace circuit breaker if voltage is present at terminal opposite battery feed, if all windows do not operate.

d. Check motor ground wire for good ground.

e. Motor is thermal protected and will not operate when warm, allow to cool and recheck.

116. WINDOW OPERATES IN ONE DIRECTION ONLY FROM EITHER MASTER OR DOOR SWITCH

a. Check switch.

b. Check connections at motor junction block and leads from junction block to motor. Replace motor if connections at junction are clean and tight.

117. CIRCUIT BREAKER "CLICK" ON AND OFF CONTINUOUSLY AND WINDOW DOES NOT OPERATE

a. Check for ground between circuit breaker and switches by disconnecting one wire at a time from circuit breaker to locate circuit containing ground. Replace wire or grounded switch.

118. WINDOW OPERATES IN WRONG DIRECTION

a. Reverse switch lead to switch involved.

Section VII

ENGINE

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Section VII
ENGINE
DATA AND SPECIFICATIONS

	C-75—1 and 2	C-76—IM-1, 2 and 4
ENGINE		
Type	V 90°	V 90°
Number of Cylinders	8	8
Bore	3.94″	4.00″
Stroke	3.63″	3.90″
Piston Displacement	354 cu. in.	392 cu. in.
Compression Ratio	9.25 to 1	9.25 to 1
Compression Pressure at 150 rpm (plugs removed) Wide Open Throttle	140 to 170 lbs.	150 to 180 lbs.
Maximum Variation Between Cylinders (any one engine)	20 lbs.	20 lbs.
Firing Order	1-8-4-3-6-5-7-2	1-8-4-3-6-5-7-2
CYLINDER NUMBERING—From Front of Engine		
Left Bank	1-3-5-7	1-3-5-7
Right Bank	2-4-6-8	2-4-6-8
CRANKSHAFT		
Type	Fully Counter-Balanced	Fully Counter-Balanced
Bearings	Steel Backed Babbitt	Steel Backed Babbitt
Journal Diameter	2.4995 to 2.5005″	2.687 to 2.688″
Crank Pin Diameter	2.249 to 2.250″	2.374 to 2.375″
Maximum Out-of-Round Permissible	.001″	.001″
Number Main Bearings	5	5
Diameter Clearance (Desired)	.005 to .0015″	.005 to .0015″
End Play	.002″ to .007″	.002″ to .007″
*C75-1 (2 Barrel Carburetor) C75-2 (4 Barrel Carburetor)		
Thrust Taken by	No. 3 Main Bearing	No. 3 Main Bearing
Finish at Rear Seal Surface	Diagonal Knurling	Diagonal Knurling
Interchangeability of Bearings	Upper and Lower Nos. 1, 2, 4 Upper and Lower No. 3 Upper and Lower No. 5 Not Interchangeable	Upper and Lower Nos. 1, 2, 4 Upper and Lower No. 3 Upper and Lower No. 5 Not Interchangeable
MAIN BEARINGS (service) All Available in Standard and the Following Undersizes	.001, .002, .003, .010, .012″	.001, .002, .003, .010, .012″
CONNECTING RODS AND BEARINGS		
Type	Drop Forged "I" Beam	Drop Forged "I" Beam
Length (Center to Center)	6.625″	6.951″
Weight (less bearings) (shells)	25.2 oz.	27.6 oz.

ENGINE (Cont'd)

	C-75—1 and 2	C-76—IM-1, 2 and 4
Bearings	Steel-Backed Babbitt	Steel-Backed Babbitt
Diameter and Length	2.2507 to 2.2512″ x 29/32″	2.375 x 29/32″
Diametral Clearance Desired	.0005 to .0015″	.0005 to .0015″
Maximum Allowable Before Reconditioning	.0025″	.0025″
Side Clearance	.006 to .014″	.006 to .014″
Bearings for Service	Standard .001, .002, .003, .010, .012″ US	Standard .001, .002, .003, .010, .012″ US
CONNECTING ROD BUSHING		
Type	Steel-Backed Bronze	Steel-Backed Bronze
Number of Bearings	8	8
Diameter and Length	.9843 to .9846 x 1¼″	.9843 to .9846 x 1¼″
Interchangeability	All	All
Clearance	.0001 to .0004″ Selective	.0001 to .0004″ Selective
CAMSHAFT		
Drive	Chain	Chain
Bearings	Steel-Backed Babbitt	Steel-Backed Babbitt
Number	5	5
Thrust Taken By	Thrust Plate	Thrust Plate
End Play	.002 to .006″	.002 to .006″
Maximum Allowable Before Reconditioning	.010″	.010″
Diametral Clearance	.001 to .003″	.001 to .003″
Maximum Allowable Before Reconditioning	.005″	.005″
CAMSHAFT BEARING JOURNALS		
Diameter and Length		
No. 1	1.998 to 1.999 x 15/16″	1.998 to 1.999 x 15/16″
Nos. 2, 3 and 4	1.998 to 1.999 x ¾″	1.998 to 1.999 x ¾″
No. 5	1.4355 to 1.4365 x 29/32″	1.4355 to 1.4365 x 29/32″
CAMSHAFT BEARINGS		
Diameter and Length (after reaming)		
No. 1	2.000 to 2.001 x 15/16″	2.000 to 2.001 x 15/16″
Nos. 2, 3 and 4	2.000 to 2.001 x 13/16″	2.000 to 2.001 x 13/16″
No. 5	1.4375 to 1.4385 x 29/32″	1.4375 to 1.4385 x ⅞″
TIMING CHAIN		
Adjustment	None	None
Number of Links	68	68
Pitch	.375″	.375″
Width	1⅛″	1⅛″

ENGINE (Cont'd)

	C-75—1 and 2	C-76—IM-1, 2 and 4
TAPPETS		
Type	Hydraulic	Hydraulic
Clearance in Block	.0005 to .0015″	.0005 to .0015″
Body Diameter	.9040 to .9045″	.9040 to .9045″
Clearance Between Valve Stem Rocker Arm or Tappet	Dry Lash .060 to .210″	Dry Lash .060 to .210″
PISTONS		
Type	Horizontal Slot w/steel strut	Horizontal Slot w/steel strut
Material	Aluminum Alloy Tin Coated	Aluminum Alloy Tin Coated
Land Clearance (diametral)	.028 to .033″	.029 to .034″
Clearance at Skirt	1½″ from Bottom of Skirt .0005 to .0015″	1½″ from Bottom of Skirt .0005 to .0015″
Weight (Std. through .060″ oversize)	646 gm.	700 gm.
Piston Length (overall)	3.99 in.	4 in.
Ring Groove Depth		
No. 1	.200″	.209″
No. 2	.200″	.209″
No. 3	.194″	.201″
Pistons for Service	Std. .005, .020, .040, .060″ OS	Std. .005, .020, .040″ OS
PISTON PINS		
Type	Full Floating	Full Floating
Diameter and Length	.9841 to .9843 x 3.140 to 3.150″	.9841 to .9843 x 3.140 to 3.150″
Clearance in Piston (thumb press at 70° F.)	.0000 to .0005″	.0000 to .0005″
End Play	.004 to .026″	.004 to .026″
Clearance in Rod (selective)	.0001 to .0004″	.0001 to .0004″
Piston Pins for Service	Std., .003, .008″ OS	Std., .003, .008″ OS
Direction Offset in Piston	Toward Right Side of Engine	Toward Right Side of Engine
PISTON RINGS		
Number of Rings per Piston	3	3
Compression	2	2
Oil	1	1
Width of Rings—		
(Compression)	.0775 to .0780″	.0775 to .0780″
(Oil)	.1860 to .1865″	.1860 to .1865″
Piston Ring Gaps (all)	.010 to .020″	.013 to .025″
RING SIDE CLEARANCE		
(Compression)		
Upper	.002 to .0035″	.002 to .0035″

ENGINE (Cont'd)

	C-75—1 and 2	C-76—IM-1, 2 and 4
Intermediate	.002 to .0035″	.002 to .0035″
(Oil)	.001 to .0025″	.0010 to .0025″
VALVES—Intake		
Material	Silicon-Chromium Steel	Silicon-Chromium Steel
Head Diameter	1 15/16″	2″
Length (to top of valve face)	4 23/32″	5 1/32″
Stem Diameter	.372 to .373″	.372 to .373″
Stem to Guide Clearance	.001 to .003″	.001 to .003″
Maximum Allowable Before Reconditioning	.004″	.004″
Angle of Seat	45°	45°
Adjustment	None	None
Lift	.388″	.388″
VALVES—Exhaust		
Material	Nitrogen Treated Manganese Chromium—Nickel Steel	
Head Diameter	1 1/2″	1 3/4″
Length (to top of valve face)	4 3/4″	5 1/32″
Stem Diameter	.371 to .372″	.371 to .372″
Stem to Guide Clearance	.002 to .004″	.002 to .004″
Maximum Allowable Before Reconditioning	.006″	.006″
Angle of Seat	45°	45°
Adjustment	None	None
Lift	.388″	.388″
VALVE SPRINGS		
Number	16	16
Free Length	2″	2″
Load When Compressed to (valve closed)	1 11/16″ 78 to 88 lbs.	1 11/16″ 78 to 88 lbs.
Load When Compressed to (valve open)	1 5/16″ 170 to 184 lbs.	1 5/16″ 170 to 184 lbs.
Valve Springs I.D.	1.010 to 1.030″	1.010 to 1.030″
CYLINDER HEAD		
Number Used	2	2
Combustion Chamber	Polyspherical	Hemispherical
Valve Seat Runout (maximum)	.002″	.003″
Intake Valve Seat Angle	45°	45°
Seat Width (finished)	.060 to .085″	.060 to .085″
Exhaust Valve Seat Angle	45°	45°
Seat Width (finished)	.040 to .060″	.040 to .060″

ENGINE (Cont'd)

	C-75—1 and 2	C-76—IM-1, 2 and 4
Cylinder Head Gasket Compressed (thickness)	.027″	.028″
ENGINE LUBRICATION		
Pump Type	Rotary, Full Pressure	Rotary, Full Pressure
Capacity (qts.)	5*	5*
Pump Drive	Camshaft	Camshaft
Operating Pressure at 40 to 50 mph	40 to 65 lbs.	40 to 65 lbs.
Pressure Drop Results from Clogged Filter	15 to 20 lbs.	15 to 20 lbs.
*When Filter Element is Replaced Add 1 Qt.		

SPECIAL TOOLS

Tool Number	Tool Name
C-119	Indicator—Cylinder Bore
C-385	Compressor—Piston Ring
C-425	Vacuum Gauge
C-455	Wrench—Starting Motor Flange Nut
C-647	Tester—Clutch and Valve Spring
C-690	Scale and Gauge—Piston Fitting
C-741	Reamer—Solid Valve Guide
C-756	Cleaner—Valve Guide
C-863	Timing Light—6 and 12 Volt
C-897	Driver—Welch Plug Installer
C-3005	Wrench—Torque 100 Foot-Pounds (Sensory Type)
C-3012	Reamer—Cylinder Bore Ridge
C-3020	Tool Main Bearing Seal
C-3024	Tool—Rocker Arm and Spring Compressor
C-3025	Sleeve—Guide Wear Measuring—Intake
C-3026	Sleeve—Guide Wear Measuring—Exhaust
C-3028	Reamer Set—Valve Tappet
C-3033	Puller Set—Damper, Sprocket, Crank Gear
C-3038	Fixtures—Cylinder Head Holding (FirePower)
C-3046	Tool—Piston Ring Installer (SpitFire)
C-3049	Reamer—Piston Pin Line (.980 to 1.030)
C-3052	Remover—Distributor Shaft Bushing
C-3053	Driver and Burnisher—Distributor Drive Shaft Bushing
C-3054	Wrench—Spark Plug
C-3059	Tool—Main Bearing Upper Shell
C-3061	Gauge—Valve Stem Length (FirePower)

SPECIAL TOOLS (Cont'd)

Tool Number	Tool Name
C-3065	Gauge—Cylinder Compression
C-3066	Connector—Timing Light
C-3068	Rack—Hydraulic Tappet
C-3075	Gauge—Top Dead Center (FirePower)
C-3132	Puller and Installer—Camshaft Bearing
C-3151	Driver—Welch Plug Installing
C-3160	Pliers—Hydraulic Tappet Leakdown Checking
C-3167	Stand—Engine Repair
C-3168	Adapter—Engine Repair Stand
C-3216	Puller—Hydraulic Tappet
C-3221	Tool—Piston and Connecting Rod Assembly
C-3339	Dial Indicator Set
C-3419	Wrench—Distributor Lock Plate
C-3422	Compressor—Valve Spring (FirePower)
C-3427	Reamer—Valve Guide (.404 to .405 inch)
C-3428	Compressor—Valve Spring (SpitFire)
C-3430	Reamer—Valve Guide (.389 to .390 inch) (SpitFire)
C-3433	Reamer—Valve Guide (.379 to .380 inch) (SpitFire)
C-3436	Gauge—Valve Stem Length (SpitFire)
C-3466	Plate—Engine Lifting
C-3495	Tool—Piston Ring Installer (FirePower)
C-3501	Cylinder Bore Deglazing Hone
C-3506	Removing and Installing Tool—Chain Case Cover Oil Seal
C-3509	Tool—Camshaft Holding
C-3511	Tool—Rear Main Bearing Seal Installing
C-3574	Tool Main Bearing Seal
DD-883	Driver—Valve Guide

TIGHTENING REFERENCE

	(Foot-Pounds)
Camshaft Sprocket Bolt	35
Camshaft Sprocket Hub Thrust Plate Bolt	15
Carburetor to Manifold Stud Nut	15
Chain Case Cover Bolt	35
Connecting Rod Bearing Cap Bolt Nut	45
Cylinder Head Bolt	85
Distributor Clamp Bolt	15
Engine Front Mounting to Frame Nut	85
Engine Front Mounting to Block Nut	45
Exhaust Manifold Stud Nut	25
Exhaust Pipe Flange Bolt Nut	40

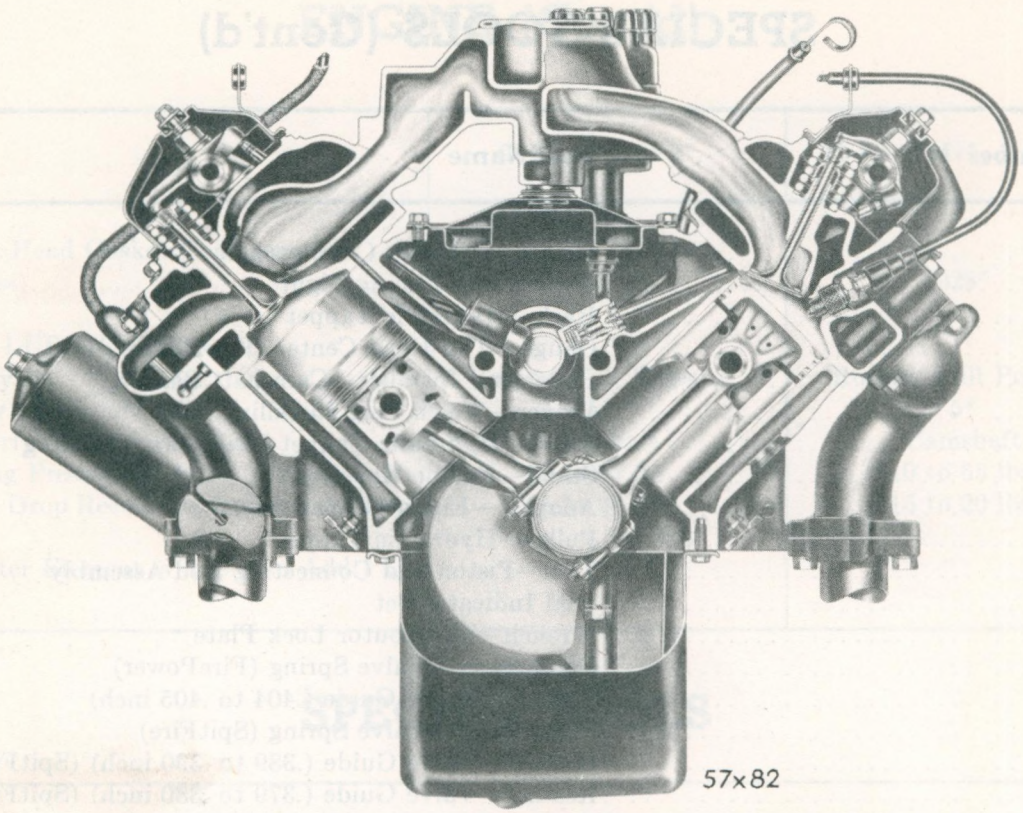

Fig. 1—SpitFire V-8 Engine (End Sectional View)

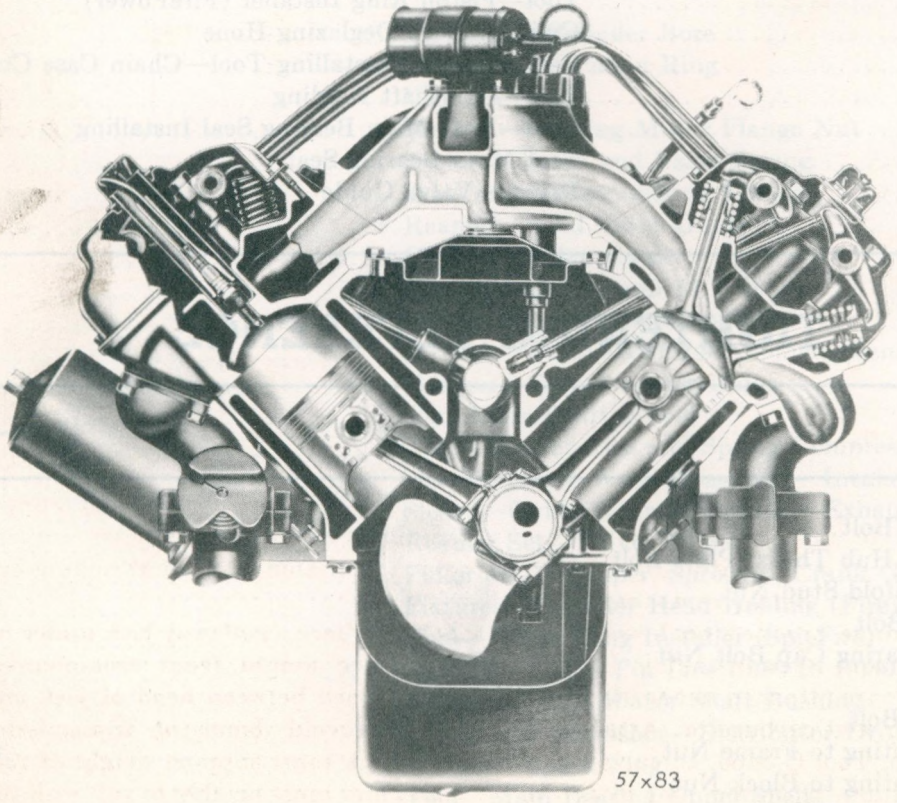

Fig. 2—FirePower V-8 Engine (End Sectional View)

Section VII
ENGINE (FIGS. 1 and 2)

1. MINOR TUNE-UP

The following procedures are provided as a guide which should be followed when performing minor engine repairs or a complete engine over-haul.

Clean and adjust spark plugs (.035 inch gap). Adjust or replace distributor contact points (.015 to .018 inch gap). Check distributor cap for cracks and corrosion. Inspect rotor, rotor spring and plunger. Inspect distributor to spark plug wires for shorts. Inspect small lead wires for tightness, breakage, or damaged insulation. Check for excessive play in distributor vacuum advance plate bearing. Reset ignition timing. Check battery specific gravity and clean and tighten battery connections. Check starter amperage draw. Inspect fan belt, and check adjustment. Tighten carburetor flange nuts to 15 foot-pounds torque. Set carburetor idle mixture adjustment. Adjust throttle stop screw so engine idles at 450 to 500 r.p.m. Check manifold heat control valve.

2. MAJOR TUNE-UP

On cars equipped with air conditioning, power steering, power brakes, heater, etc., refer to Section covering this equipment for removal, installation and adjustment procedures.

A periodic engine tune-up will assure maximum engine performance and fuel economy. In addition, perform all steps of a "Minor Tune-Up." Tighten manifold nuts. Make a compression test. The compression should not vary more than 20 pounds between cylinders. Refer to "Engine Data and Specifications" for compression pressures. Check coil and condenser and inspect primary and secondary wires. Service the Air Cleaner — **DO NOT WASH OR OIL.** Normal operation — Remove filter cartridge every 15,000 miles. Service more frequently under severe dusty conditions. (See Fig. 3.) Test fuel pump for pressure and vacuum, and adjust carburetor. Refer to Fuel and Exhaust System, Section VII, "Carburetor Adjustments." Check combustion analysis. Check manifold heat control valve. Road test car as a final check.

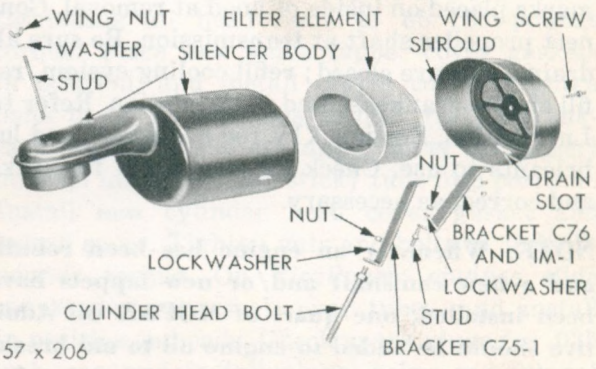

Fig. 3—Carburetor Air Cleaner (Disassembled View)

SERVICE PROCEDURES

3. REMOVAL OF ENGINE ASSEMBLY (FROM CAR)

Drain cooling system and remove battery. Remove fan shroud, (Air Conditioning Models only) radiator and hood. **Before removing hood, scribe outline of hinge brackets on hood to assure proper adjustment when installing.** Disconnect fuel lines and wire attached to engine units. Remove air cleaner and carburetor. Attach engine lifting fixture, Tool C-3466, to carburetor flange studs on intake manifold and attach a chain hoist to fixture eyebolt.

Disconnect propeller shaft, wires and linkage at transmission. Remove exhaust pipe. (Be sure exhaust system is sufficiently supported while engine is removed.) Remove rear crossmember to transmission support attaching bolts.

NOTE: Place a rollaway jack under transmission to relieve weight from crossmember. Place a wood block between head of jack and transmission to avoid damaging transmission oil pan. This jack must support weight of rear of power plant and must be able to roll with the engine as engine is being removed from chassis.

Remove crossmember rear engine support. Lower car to convenient working height and remove engine front support. With chain hoist, raise engine and, at same time work engine out of chassis. If engine is to be disassembled, place engine in engine repair stand, Tool C-3167, using transmission mounting bolts.

4. INSTALLING ENGINE (IN CAR)

Install engine lifting fixture, Tool C-3466 and attach chain hoist to fixture eyebolt. Lower engine carefully, until front and rear of engine are approximately positioned. Place a rollaway jack under transmission to support weight of rear of engine. Install engine rear support crossmember. Position engine and install nuts at front mounts. Position and install rear engine support bolts and remove jack and hoist. Remove engine lifting fixture. Install manifold, carburetor, fuel lines, wiring and linkage. Install radiator, radiator hoses, wires and radiator shroud. Install exhaust pipes, using new gaskets. Reinstall hood by checking scribe marks placed on inside of hood at removal. Connect propeller shaft at transmission. Be sure all drain cocks are closed; refill cooling system, refill engine crankcase and transmission. Refer to Lubrication, Section XIV for quantities and lubricants to use. Check entire system for leaks and correct as necessary.

NOTE: Whenever an engine has been rebuilt and a new camshaft and/or new tappets have been installed, one quart of MOPAR Oil Additive should be added to engine oil to aid break-in. The oil mixture should be left in engine for a minimum of 500 miles. It is not necessary however, to drain the mixture before normal oil change is required, nor is it necessary to use the oil additive at subsequent oil changes.

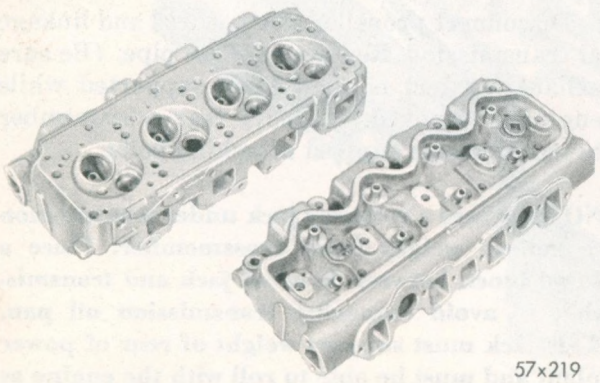

Fig. 4—Cylinder Head (SpitFire Engine)

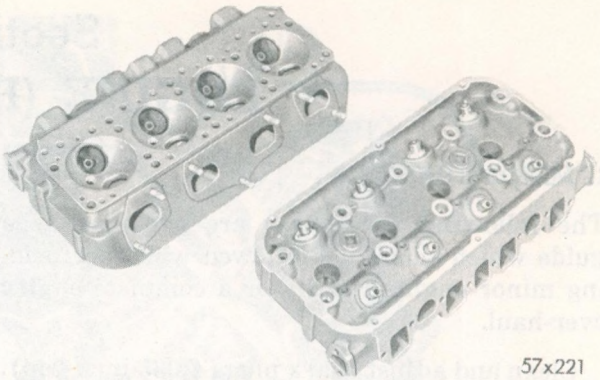

Fig. 5—Cylinder Head (FirePower Engine)

Start engine, warm up to 160 degrees F., check timing and adjust carburetor as necessary.

5. REMOVAL OF CYLINDER HEADS (Fig. 4 and 5)

Drain cooling system. Remove generator. Remove carburetor air cleaner and fuel line. Disconnect accelerator linkage. Remove vacuum control tube at carburetor and distributor. Disconnect coil wires and heater hose. Remove heat indicator sending unit wire. Remove oil level indicator (dip stick). Remove air tube between automatic choke and exhaust manifold. Remove water outlet manifold. Remove heater blower. Remove ignition cable cover and disengage insulators from spark plugs. Use a thin wall socket, or Tool C-3054 to remove spark plugs and tubes. Remove intake manifold, ignition coil and carburetor as an assembly. Remove cylinder head covers and gaskets. Disconnect exhaust pipes at manifold flanges. Remove bolts that attach rocker arm support brackets to cylinder head and block, and pull rocker assemblies and bolts directly away from heads.

CAUTION

The rocker arm assembly attaching bolts (FirePower) also hold cylinder heads to block. When these bolts are removed, cylinder heads are loose and are held by two dowel pins only.

Remove push rods and place them in their respective slots in holder Tool-C-3068. Lift off cylinder head and place into holding fixture Tool C-3038. Remove exhaust manifold and gasket, if cylinder head is to be replaced.

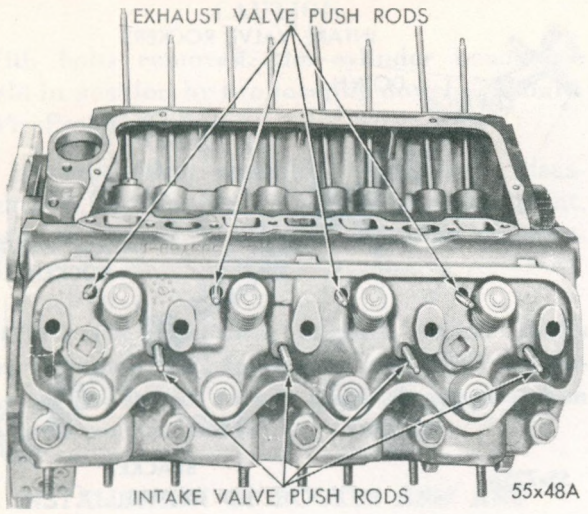

Fig. 6—Push Rods Installed (SpitFire)

NOTE: On FirePower Engine only, the right cylinder head rocker shaft brackets and the cylinder head bolts can be removed as a complete assembly. On the left cylinder head remove the stop light switch from the master brake cylinder, oil level indicator, (on Power Steering remove pump oil line) before removing the cylinder head assembly.

6. INSTALLATION OF CYLINDER HEADS

Clean gasket surfaces of cylinder block and cylinder head. Check all surfaces with a straightedge if there is any reason to suspect leakage. Install cylinder heads and **new** cylinder head gaskets. Coat gaskets with MOPAR Perfect Seal, Part No. 1122893 or equivalent sealer. Install push rods as shown in Figures 6 and

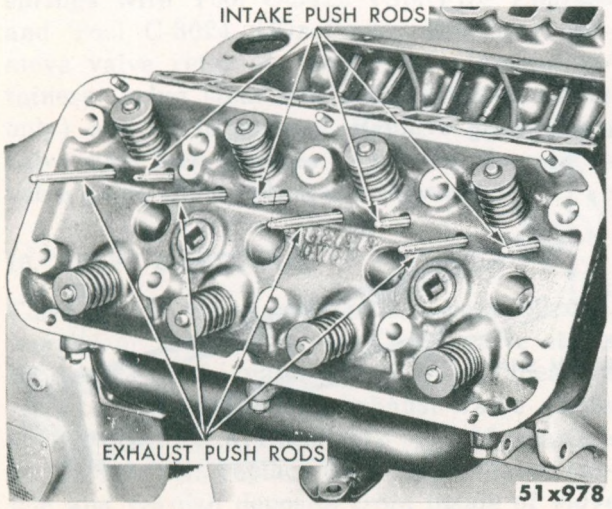

Fig. 7—Push Rods Installed (FirePower)

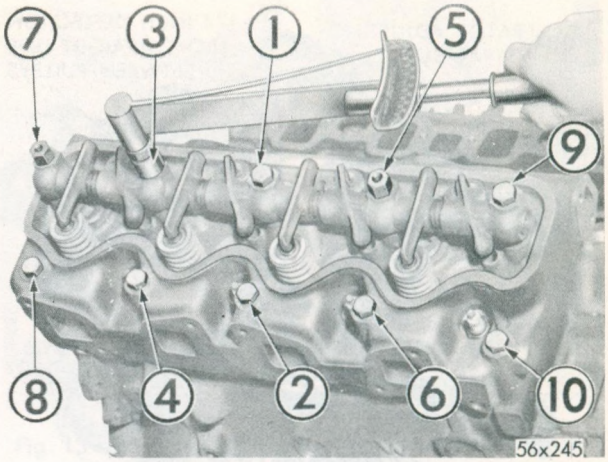

Fig. 8—Tightening Cylinder Head Bolts (SpitFire)

7. Insert cylinder head bolts into rocker arm support brackets and place rocker arm assemblies in position on head, lining up all push rods to their respective rocker arms. Starting at top center, tighten all cylinder head bolts to 60-80 foot-pounds torque, in sequence shown in Figure 8 and 9. Then repeat the procedure, tightening all head bolts to 85 foot-pounds torque. Place **new** valve tappet cover gaskets in position, and install tappet cover. Tighten bolts to 50 inch-pounds torque. Install crankcase breather tube on tappet cover and insert oil level indicator (dip stick) tube into position. Install **new** cylinder head cover gasket and install cover. Tighten nuts and bolts to 30 inch-pounds torque. On FirePower engines slide spark plug tube seals over tubes, and install in position in heads. Check spark plugs for .035 inch gap and install plugs, being careful not

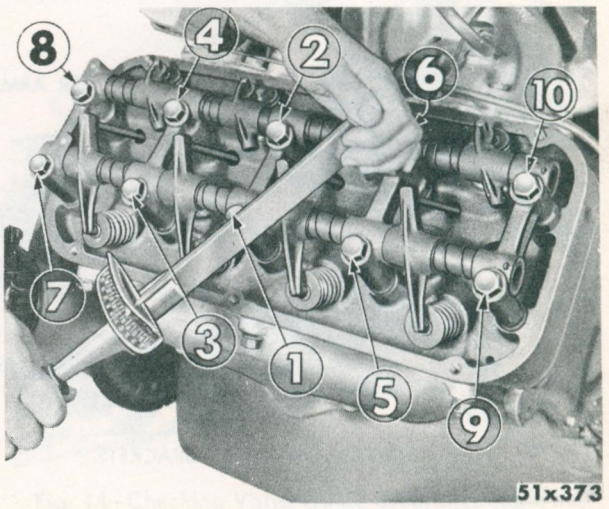

Fig. 9—Tightening Cylinder Head Bolts (FirePower)

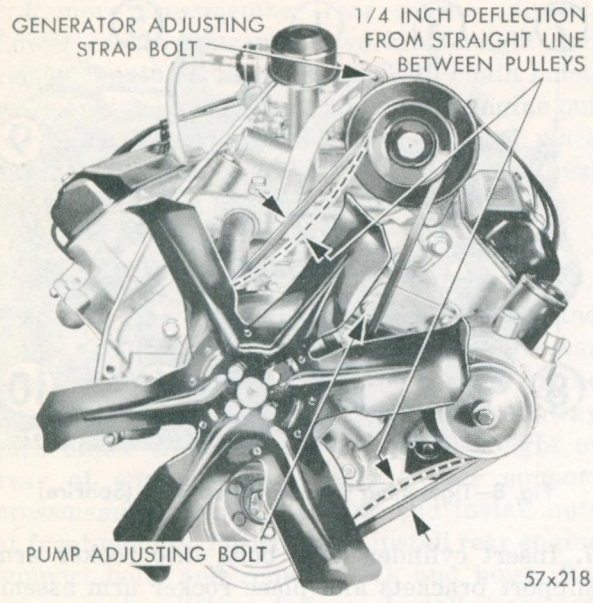

Fig. 10—Adjusting of Fan Belts (FirePower) (Typical of SpitFire)

to drop them on electrodes as this would cause gap setting to be altered. Tighten spark plugs to 30 foot-pounds torque with Tool C-3054. Install **new** intake manifold gaskets and manifold. Tighten bolts to 30 foot-pounds torque.

NOTE: When installing intake manifold, insert short bolts in holes on extreme ends of manifold.

Install distributor cap coil wire, spark plug cables and insulators. On FirePower Engines place spark plug tube seal retainers in position and install spark plug covers, after carefully

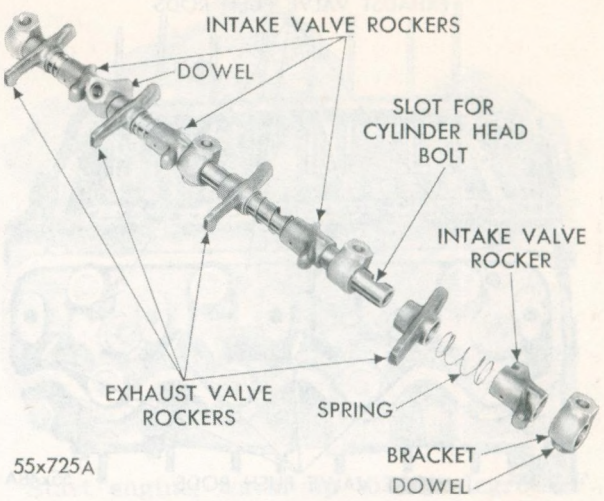

Fig. 11—Rocker Shaft Assembly (Disassembled View) (SpitFire)

arranging spark plug cables. Tighten screws securely. Install generator. Tighten generator bracket bolts to 50 foot-pounds torque and generator mounting nut to 20 foot-pounds torque.

NOTE: When adjusting fan and generator belts, obtain enough slack so that belts may be depressed, as shown in Figure 10. When dual belts are used, both belts should have equal tension.

7. REMOVAL OF ROCKER ARMS AND SHAFT ASSEMBLY

Remove rocker arm cover and gasket. Remove bolts that attach rocker arm support brackets and cylinder head to cylinder block and remove rocker arms and brackets as an assembly.

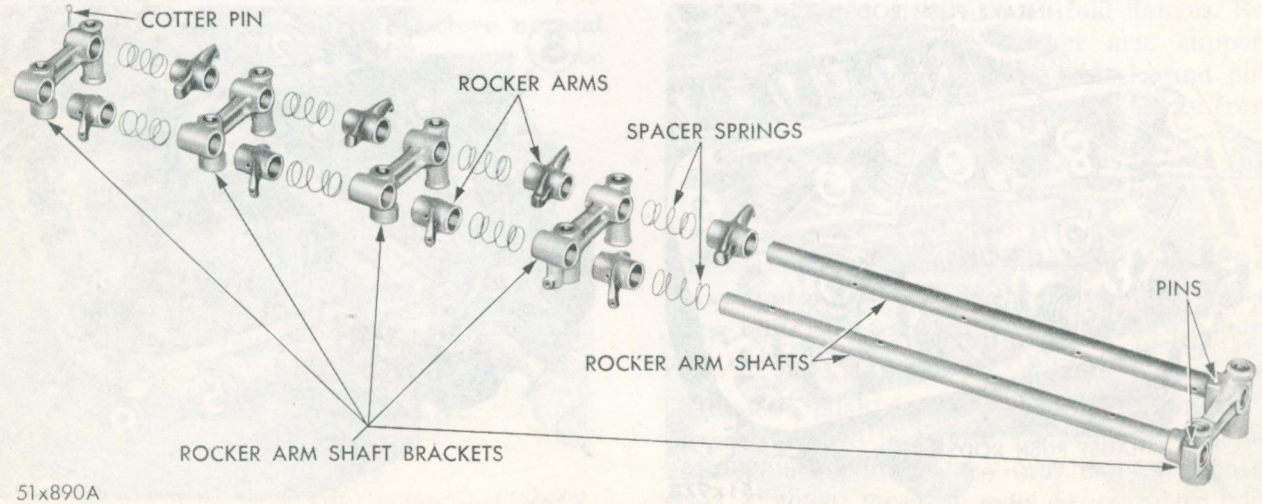

Fig. 12—Rocker Shaft Assembly (Disassembled View) (FirePower)

CAUTION

With bolts removed, the cylinder heads are held in position by two locating dowel pins only. (FirePower Engines)

If rocker arm assemblies have been disassembled for cleaning, inspection or replacement, refer to Figures 11 and 12 for proper reassembly.

NOTE: On FirePower engines rocker shafts are stamped "IN" for intake and "EX" for exhaust. The intake rocker arms are shorter than exhaust rocker arms.

8. INSTALLATION OF ROCKER ARM AND SHAFT ASSEMBLY

Install push rods as shown in Figures 6 and 7. The push rods should be properly positioned in rocker arm and tappets.

CAUTION

Be sure locating dowels on brackets are in proper alignment in head, as shown in Figure 11.

Position rocker arm assemblies. Install cylinder head bolts. Tighten bolts 60-80 foot-pounds torque in sequence shown in Figures 8 and 9. Then repeat the procedure, tightening all head bolts to 85 foot-pounds torque.

9. REMOVAL OF VALVES AND VALVE SPRINGS

With cylinder head removed, compress valve springs with Tool C-3422 (SpitFire Engines and Tool C-3024 (FirePower Engines). Remove valve retaining locks, valve spring retainers, valve stem cup seals (intake valves only) and valve springs. **Remove burrs from valve stem lock grooves to prevent damage to valve guide when valves are removed.**

10. VALVE INSPECTION

Clean valves thoroughly, and discard burned, warped or cracked valves. Check valve stems for wear. Intake valve stems should measure .372 to .373 inch, and exhaust valve stems should measure .371 and .372 inch. If wear exceeds .002 inch, replace the valve. Remove carbon and varnish deposits from inside of valve guides with cleaner, Tool C-756.

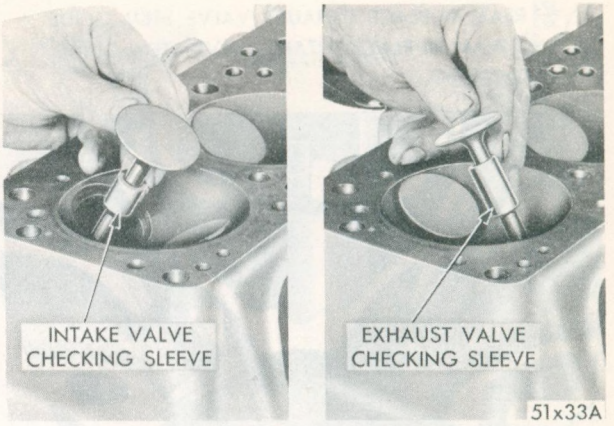

Fig. 13—Installing Sleeves to Check Guide Clearance (FirePower) (Typical of SpitFire)

NOTE: On SpitFire Engines, the valve guides are cast integrally with the cylinder head. Service valves with oversize stems are available for these engines.

Check valve stem to guide clearance as follows: Install sleeve, Tool C-3025, over intake valve stem, and sleeve Tool C-3026 on exhaust valve stem and install valves (Fig. 13). These special sleeves place valve at working height for easy checking with a dial indicator. Attach dial indicator Tool C-3339 to cylinder head and set it at right angle to edge of valve being checked (Fig. 14). Move valve to and from indicator. The total dial indicator reading should not exceed .008 inch on intake valves, or .014 inch on exhaust valves. If readings exceed the above tolerances, install new valve guides

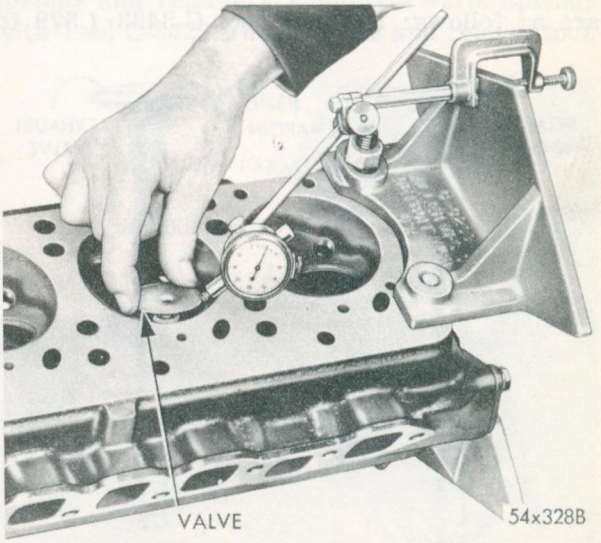

Fig. 14—Checking Valve Guide Clearance (SpitFire) (Typical of FirePower)

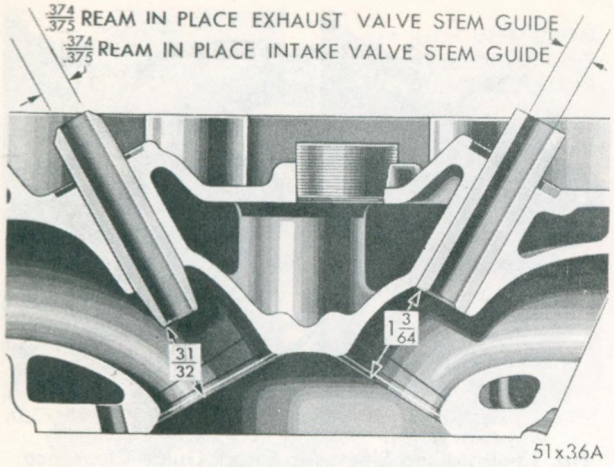

Fig. 15—Exhaust and Intake Valve Guide Installed in Head (FirePower)

(FirePower Engines), or ream guides for oversize valves (SpitFire Engines), to next oversize (if other than standard).

11. REMOVAL AND INSTALLATION OF VALVE GUIDES

On FirePower Engines drive out guides through top of cylinder heads with Tool DD-883. Install as follows: Turn cylinder head with combustion chamber facing up. Drive valve guides into position with a suitable driver to dimensions shown in Figure 15. After new valve guides have been installed, ream each guide .374 to .375 inch with Tool C-741. On SpitFire Engines valves with oversize stems are available in .005, .015, and .030 inch. Reamers to accommodate the oversize valve stems are as follows: Reamer Tool C-3433 (.379 to .380 inch), Reamer Tool C-3427 (.404 to .405 inch). Slowly turn reamer by hand and clean guide thoroughly before installing new valve.

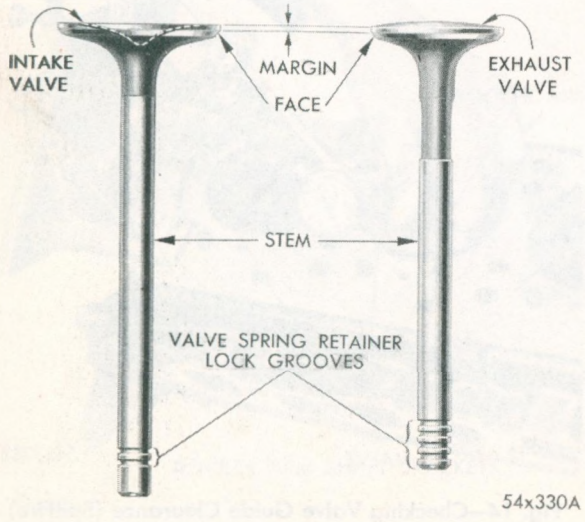

Fig. 16—Intake and Exhaust Valve Nomenclature

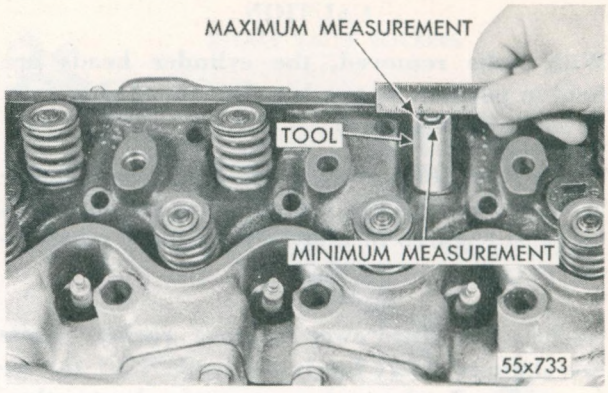

Fig. 17—Checking Valve Stem Position (SpitFire)

CAUTION

Do not attempt to ream valve guides from standard directly to .030 inch. Use step procedure of .005, .015, and .030 inch so the valve guides may be reamed true in relation to valve seat.

12. REFACING VALVES AND VALVE SEATS

The intake and exhaust valves are faced to a 45 degree angle. When refacing valve, always check remaining margin (Fig. 16). Valves with less than 3/64 inch margin should be discarded. The angle of both valve and seat should be identical. When refacing valve seats with Tool MTH-80, it is important that correct size valve guide pilot be used for reseating stones. A true and complete surface must be obtained. Check concentricity of valve seat using a dial indicator; total runout should not exceed .002 inch (total indicator reading). When the seat is

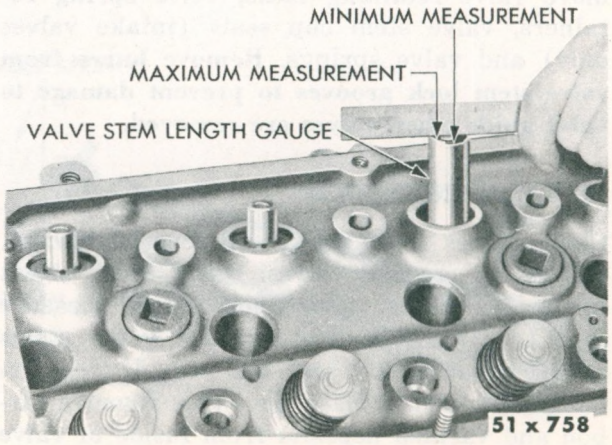

Fig. 18—Checking Valve Stem Position (FirePower)

properly positioned, width of intake seats should be 1/16 to 3/32 inch. The width of exhaust seats should be 3/64 to 1/16. When valves and seats are reground, the position of valve in head is changed, shortening operating length of hydraulic tappet. This means that plunger is operating closer to its bottomed position, and less clearance is available for thermal expansion of valve mechanism during high speed driving. Design of plunger travel includes a safety factor for normal wear and refacing of valves and seats. The dimension from valve spring seat in head to valve tip should be checked with gauge Tool C-3436 for SpitFire Engines and gauge Tool C-3061 for FirePower Engines, (Figs. 17 and 18).

The end of cylindrical gauge and bottom of slotted area represent maximum and minimum allowable extension of valve stem tip beyond spring seat. If tip exceeds maximum, grind to approach, but do not go below minimum allowable on gauge.

13. TESTING VALVE SPRINGS

Whenever valve springs are removed they should be tested with spring tester, Tool C-647. Attach torque wrench, check tension and multiply reading by 2. The valve springs should test 170 to 184 pounds when compressed to 1 5/16 inch. Discard springs that do not meet these specifications.

Check each spring for squareness with a steel square and surface plate. (Fig. 19). If spring is more than 1/16 inch out of square, install new spring.

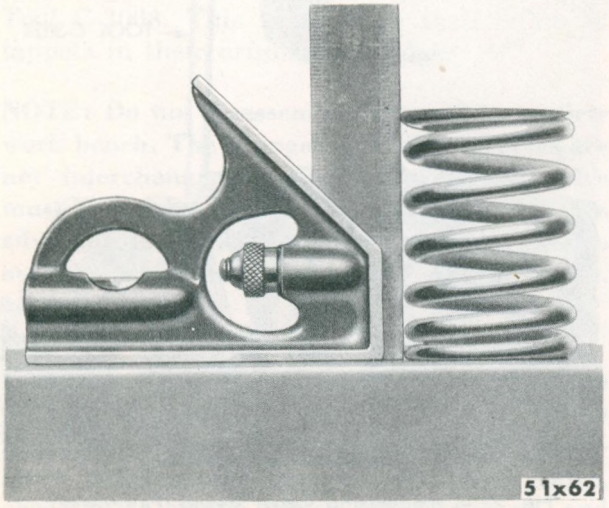

Fig. 19—Checking Valve Spring for Squareness

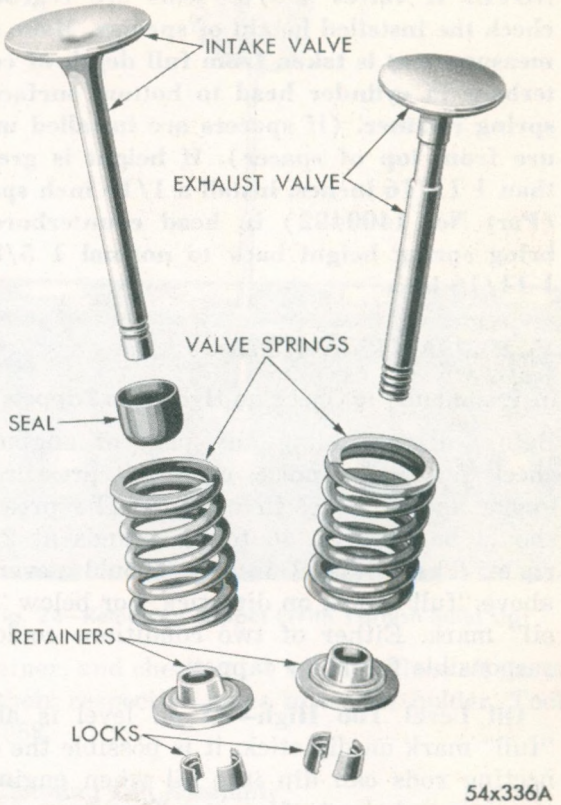

Fig. 20—Valves, Springs, Seals, Retainers and Locks (Disassembled View)

14. INSTALLING VALVES AND VALVE SPRINGS

Coat valve stems with lubricating oil and insert in position in cylinder head. Install cup seals on intake valve stems and over valve guides (Figs. 20 and 21), and install valve springs and retainers. Compress valve springs with Tool C-3422. Install locks and release tool.

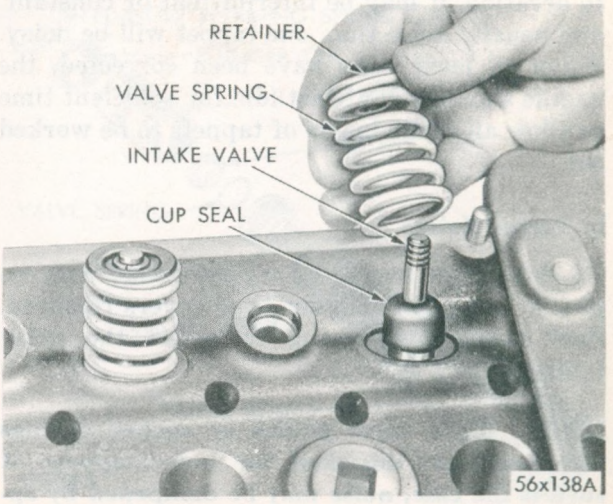

Fig. 21—Installing Intake Valves and Cup Seals

NOTE: If valves and/or seats are reground, check the installed height of springs. Make sure measurement is taken from full depth of counterbore in cylinder head to bottom surface of spring retainer. (If spacers are installed measure from top of spacer). If height is greater than 1 11/16 inches, install a 1/16 inch spacer (Part No. 1400482) in head counterbore to bring spring height back to normal 1 5/8 to 1 11/16 inch.

15. HYDRAULIC TAPPETS

a. Preliminary to Checking Hydraulic Tappets

Before disassembling any part of engine to check for tappet noise, check oil pressure at gauge and oil level in oil pan. The pressure should be between 40 to 65 pounds at 2,000 r.p.m. The oil level in pan should never be above "full" mark on dip stick, nor below "add oil" mark. Either of two conditions could be responsible for noisy tappets.

Oil Level Too High—If oil level is above "full" mark on dip stick, it is possible the connecting rods can dip into oil when engine is running and create foaming. This foam is fed to the hydraulic tappets by the oil pump, causing them to go flat and allowing valves to seat noisily.

Oil Level Too Low—Low oil level may allow pump to take in air which, when fed to tappets, causes them to lose length and allows valves to seat noisily. Any leaks on intake side of pump through which air can be drawn will create the same tappet action. When tappet noise is due to aeration, it may be intermittent or constant, and usually more than one tappet will be noisy. When oil level leaks have been corrected, the engine should run at fast idle for sufficient time to allow all of air inside of tappets to be worked out.

b. Tappet Noises

To determine source of tappet noise, run engine at idle with cylinder head covers removed. Feel each valve spring to detect the noisy tappet.

NOTE: Worn valve guides or cocked springs are sometimes mistaken for noisy tappets. If such is the case, noise may be dampened by applying side thrust on valve spring. Inspect rocker arm push rod sockets and push rod ends for wear. If noise is not appreciably reduced, it can be assumed the noise is in the tappet.

Valve tappet noise can be separated into two types, light noise and heavy noise. A light noise is usually caused by excessive leakdown around the unit plunger, or by plunger partially sticking in cylinder. A heavy noise is caused either by a tappet check valve not seating, or by foreign particles becoming wedged between plunger and tappet body, causing plunger to stick in down position. This heavy noise will be further evidenced by clearance between valve stem and rocker arm as valve closes. In either instance, the unit assembly should be removed for inspection and cleaning.

c. Removal of Tappets (with Rocker Arms in Position)

NOTE: If all of tappets are to be removed, it will be advisable to remove rocker arms and shaft. If only one or two tappets are to be removed, proceed as follows:

Install valve spring compression Tool C-3024, over rocker arm (Fig. 22) so heel of tool rests on valve stem side. Make certain valve is seated and tappet body is resting on low point of camshaft lobe. Refer to Paragraph 17, "Locating the Low Point of Camshaft Lobe in Conjunction with Valve Tappet Face." Using handle

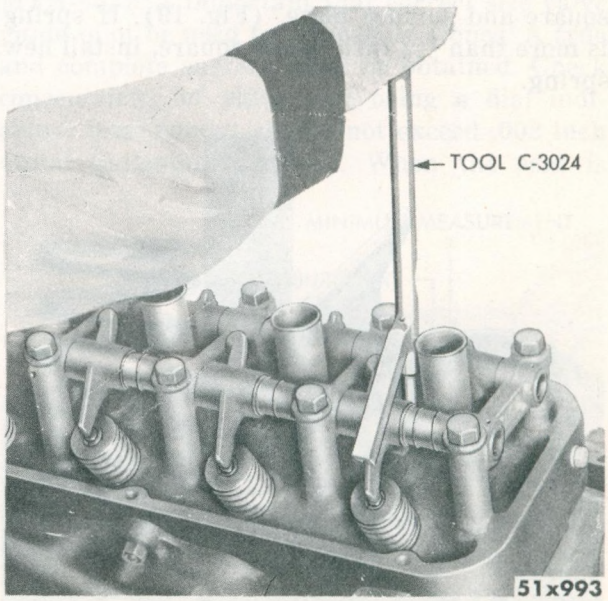

Fig. 22—Compressing Valve Spring (FirePower) (Typical of SpitFire)

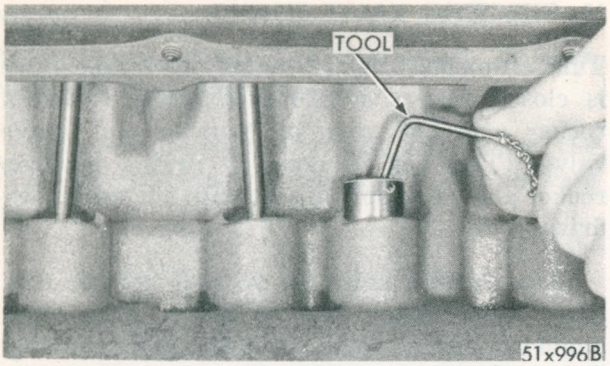

Fig. 23—Removing Tappet (Without Varnish Build Up)

of tool for leverage, compress valve springs sufficiently to raise rocker arm above push rod. While holding rocker arm in this position, slide rocker arm to one side along the tube.

NOTE: To avoid damage to valves, be sure that piston head is well below top of travel before compressing valve springs.

Remove intake manifold, carburetor and coil as an assembly. Remove tappet chamber cover and gasket. Insert hooked portion of Tool C-3216 into hole in Tappet body (Fig. 23). (This portion of tool can be used to remove tappets without a varnish buildup). Lift tappet out of bore. If tappet sticks, slide puller portion of Tool C-3216 through cylinder head (push rod) holes (Fig. 24) and seat firmly in cap of tappet. Insert puller pin through tappet body and tool shaft in holes provided. Grasp tool handle and pull tappet out of bore with a twisting motion. If all tappets are to be removed, remove hydraulic tappets and place them in their respective holes in tappet and push rod holder, Tool C-3068. This will insure installation of tappets in their original locations.

NOTE: Do not disassemble a tappet on a dirty work bench. The plunger and tappet bodies are not interchangeable. The plunger and valve must always be fitted to the original body. It is advisable to work on one tappet at a time to avoid mixing parts. Mixed parts are not usable.

d. Disassembly (Fig. 25)

Pry out plunger retainer spring clip. Clean varnish deposits from inside of tappet body above plunger cap. Invert tappet body and remove plunger cap, plunger, flat check valve, check valve spring, check valve retainer, and plunger spring. Separate plunger, check valve

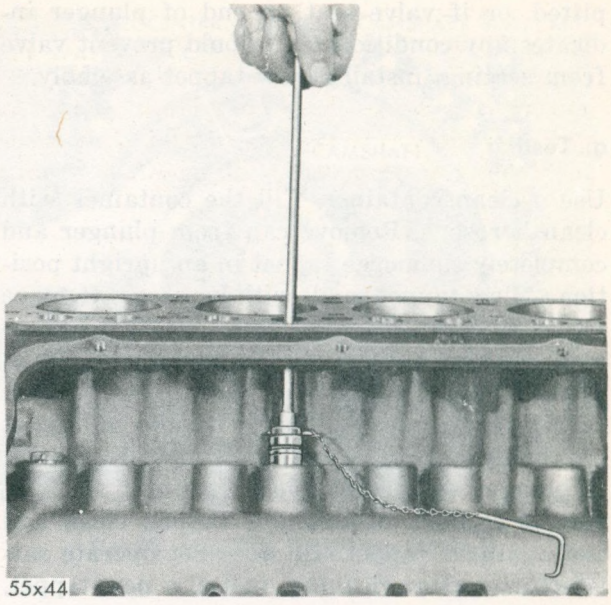

Fig. 24—Removing Tappet (With Varnish Build Up)

retainer, and check valve spring. Place all parts in their respective place in tappet holder, Tool C-3068.

e. Cleaning and Assembly

Clean all tappet parts in a solvent that will remove all varnish and carbon. Replace tappets that are unfit for further service. Assemble tappets, as shown in Figure 25.

f. Inspection

If tappet or bore in cylinder block is scored, scuffed, or shows signs of sticking, ream bore to next oversize, using Tool C-3028. If plunger shows signs of scoring or wear and valve is

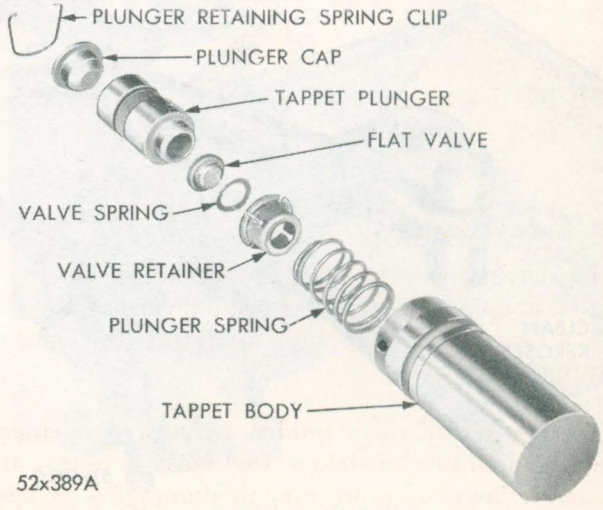

Fig. 25—Hydraulic Tappet (Disassembled View)

pitted, or if valve seat on end of plunger indicates any condition that would prevent valve from seating, install a new tappet assembly.

g. Testing

Use a clean container. Fill the container with clean kerosene. Remove cap from plunger and completely submerge tappet in an upright position. Allow tappet to fill with kerosene. Remove tappet and replace cap. Hold tappet in an upright position and insert the lower jaw of pliers, Tool C-3160, in groove of tappet body (Fig. 26). Engage jaw of pliers with top of tappet plunger. Check leakdown by compressing pliers. If plunger collapses almost instantly as pressure is applied, disassemble tappet, clean and test again. If tappet still does not operate satisfactorily after cleaning, install a new tappet.

h. Installation

Lubricate tappets. Install tappets and push rods in their original bores. Position rocker arm so it is partially seated on valve stem. Install valve spring compressor tool and compress valve spring until rocker arm can be positioned over push rod. Remove tool and install tappet chamber cover. Install intake manifold, carburetor and coil, refill cooling system, start engine, warm up to normal operating temperature.

NOTE: To prevent damage to valve mechanism, the engine must not be run above fast idle until all of hydraulic tappets have filled with oil and become quiet.

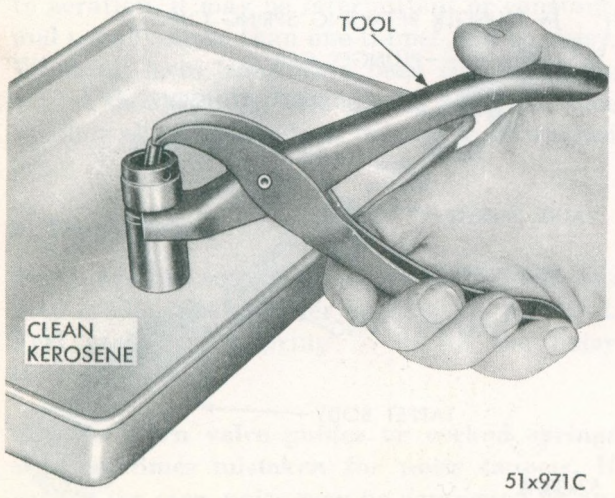

Fig. 26—Testing Hydraulic Tappet (Typical)

16. CHECKING VALVE TIMING

Turn crankshaft until Number one intake valve is closed. Insert a .210 inch spacer between rocker arm and stem of Number one intake valve. (This can be done by prying between rocker and valve spring seat with a large screwdriver).

Install a dial indicator so that pointer contacts valve spring seat as nearly at a right angle as possible. Wait until seat stops moving. This indicates that oil has bled out of hydraulic tappet and plunger has bottomed, giving, in affect, a solid tappet. Set dial indicator on zero and turn crankshaft clockwise (normal running direction) until dial indicator shows that valve has lifted .020 inch (SpitFire) and .024 inch (FirePower). The timing on the vibration damper should now read from 5 degrees (BTDC) before top dead center to 7 degrees (ATDC) after top dead center. Before making this check, it is well to check the accuracy of the (TDC) top dead center mark on the damper by bringing Number One piston to (TDC) by means of an indicator placed in spark plug opening. After valve timing has been checked, turn crankshaft counter-clockwise until tappet is back down to valve-closed position. Remove the .210 inch spacer from between the rocker arm and valve stem.

CAUTION

Under no condition should crankshaft be turned further in clockwise direction, as spacer might cause valve spring to bottom and damage valve operating mechanism.

17. LOCATING LOW POINT OF CAMSHAFT IN CONJUNCTION WITH VALVE TAPPET FACE (CYLINDER HEAD INSTALLED)

Remove distributor cap, noting position of rotor for Number One and Number Six cylinders. Set timing mark ("DC") on vibration damper to pointer. With rotor at Number One firing position, the following tappets will be on low side of cam lobe.

2—Intake	7—Intake
2—Exhaust	8—Intake
4—Exhaust	8—Exhaust

NOTE: To remove Number One intake and exhaust tappet, rotate the crankshaft ¼ turn clockwise from above position.

With rotor at Number Six firing position, the following tappets will be on low side of cam lobe:

3—Intake	5—Intake
3—Exhaust	5—Exhaust
4—Intake	7—Exhaust

NOTE: To remove Number Six intake and exhaust tappet, rotate crankshaft ¼ turn clockwise from above position.

18. REMOVAL OF TIMING GEARS AND CHAIN

Remove radiator and water pump assembly. Remove bolt and flatwasher holding vibration damper on crankshaft. Remove two of the damper bolts, install Tool C-3033, and pull damper assembly off end of crankshaft.

Remove chain cover and gasket. Slide crankshaft oil slinger off end of crankshaft. Remove fuel pump eccentric attaching bolt, cup washer and eccentric. Remove timing chain, with crankshaft and camshaft sprockets. Remove the camshaft and crankshaft gear keys from their respective slots.

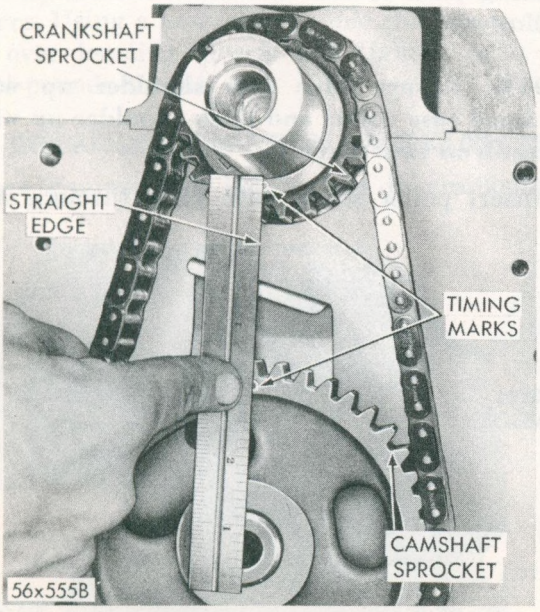

Fig. 27—Checking Alignment of Timing Marks

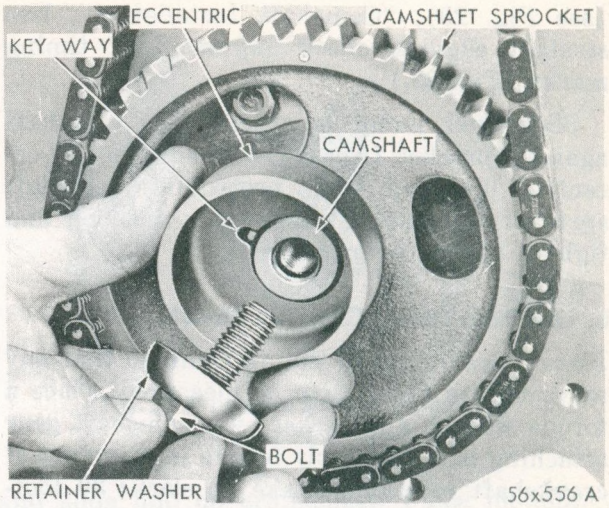

Fig. 28—Installing Fuel Pump Eccentric

19. INSTALLATION OF TIMING GEARS AND CHAIN

a. Installation

Place both camshaft sprocket and crankshaft sprocket on the bench with timing marks on exact imaginary centerline through both camshaft and crankshaft bores.

Place timing chain around both sprockets. Insert crankshaft and camshaft woodruff keys in their respective slots. Turn crankshaft and camshaft to line up with keyway locations in the sprockets.

Lift sprockets and chain (keep sprockets tight in position as described) slide both sprockets evenly over their respective shafts

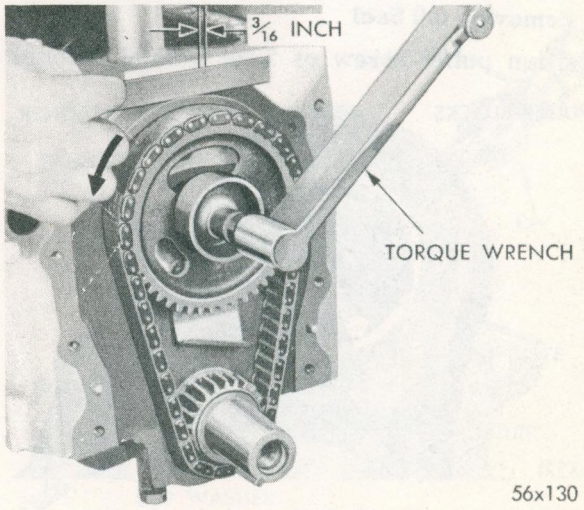

Fig. 29—Measuring Timing Chain Stretch (Typical)

(see Fig. 29), "Camshaft Installation". Use straight edge to check alignment of timing marks (Fig. 27.)

Slide fuel pump eccentric over camshaft against sprocket (Fig. 28). Be sure slot in eccentric lines up with protruding camshaft sprocket key. Install cup washer and bolt and tighten 35 foot-pounds torque.

b. Checking Timing Chain for Stretch

Place a scale next to timing chain so that any movement of chain may be measured. Place a torque wrench and socket over camshaft gear attaching bolt and apply torque in direction of crankshaft rotation to take up slack; 30 foot-pounds torque (with cylinder heads installed) and 15 foot-pounds torque (heads removed). Holding scale with dimensional reading even with edge of a chain link, apply torque in reverse direction 25 foot-pounds (with cylinder heads installed) and 15 foot-pounds (heads removed), and note the amount of chain rotation (Fig. 29). Install new timing chain, if its movement is greater than $\frac{3}{16}$ inch.

NOTE: With a torque applied to camshaft gear bolt, the crankshaft should not move. If there is any movement, however, the crankshaft should be blocked to prevent rotation.

If chain is satisfactory, slide crankshaft oil slinger over shaft and up against gear (flange away from gear.)

20. TIMING CHAIN CASE COVER OIL SEAL REPLACEMENT

a. Removing Oil Seal

Position puller screw of Tool C-3506 through

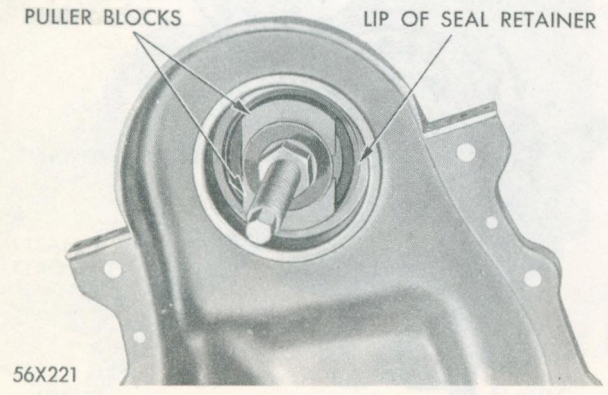

Fig. 30—Puller Blocks Expanded to Correct Pulling Position

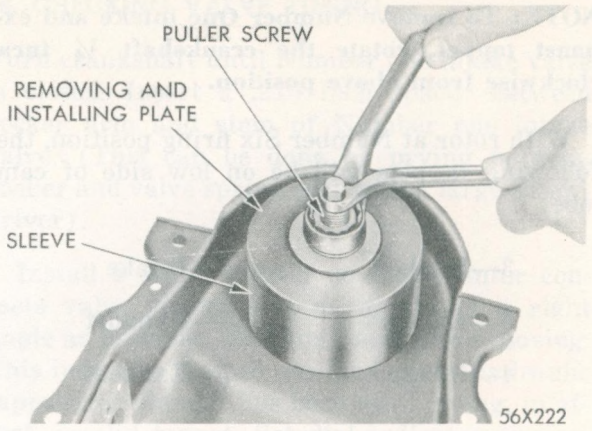

Fig. 31—Removing Oil Seal

case cover, with inside of case cover up. Position puller blocks directly opposite each other, and force angular lip between neoprene and flange of seal retainer. Place washer and nut on puller screw. Tighten nut as tight as possible by hand, forcing blocks into gap to point of distorting seal retainer lip (Fig. 30). **THIS IS IMPORTANT!** (puller is only positioned at this point.) Place sleeve over retainer and place removing and installing plate into sleeve. Place flatwasher and nut on puller screw. Hold center screw and tighten lock nut to remove seal (Fig. 31).

b. Installing Oil Seal

Insert puller screw through removing and installing plate so that the thin shoulder will be facing up.

NOTE: Always have thin shoulder up with stamped case cover, and thick shoulder up with a cast iron case cover.

Insert puller screw with plate through seal

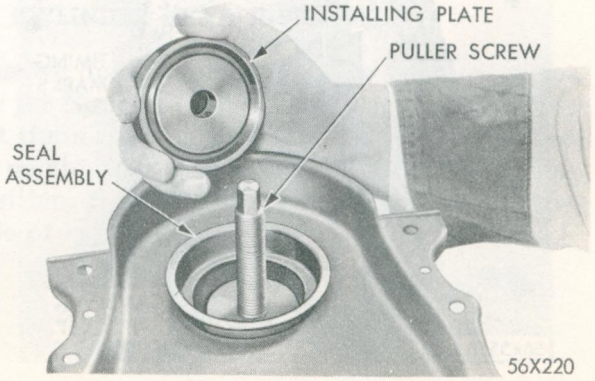

Fig. 32—Positioning Installer Plate on New Seal

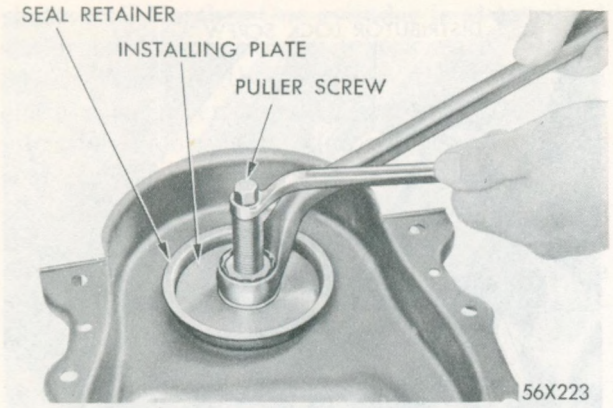

Fig. 33—Installing New Seal

opening (inside of chain case cover facing up). Place seal in cover opening, with neoprene down. Place seal installing plate into the new seal, with protective recess toward lip of seal retainer (Fig. 32). Install flatwasher and nut on puller screw, hold screw, and tighten nut (Fig. 33). Seal is properly installed when neoprene is tight against face of cover. Try to insert a .0015 feeler gauge between neoprene and cover (Fig. 34). If seal is installed properly, the feeler gauge cannot be inserted.

NOTE: It is normal to find particles of neoprene collected between the seal retainer and crankshaft oil slinger.

c. Installing Chain Case Cover

Be sure mating surfaces of chain case cover and cylinder block are clean and free from burrs. Using a **new** gasket, slide chain case cover over locating dowels and tighten bolts 15 foot-pounds torque.

21. INSTALLING VIBRATION DAMPER (Fig. 35)

Place damper hub key in slot in crankshaft,

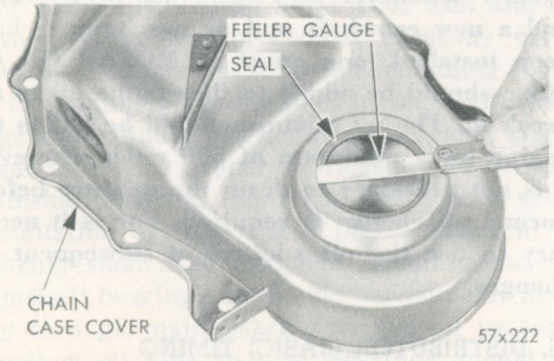

Fig. 34—Checking to Determine if Seal is Properly Seated

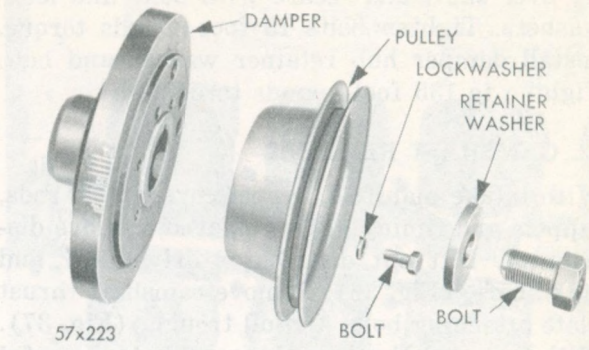

Fig. 35—Vibration Damper Assembly (Disassembled View)

and slide hub on crankshaft. Place installing tool (part of Puller set Tool C-3033) in position and press damper hub on crankshaft. Slide pul-

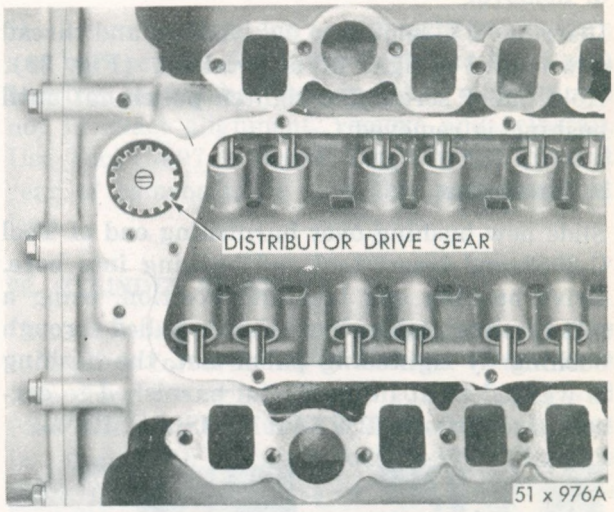

Fig. 36—Distributor Drive Gear Installation

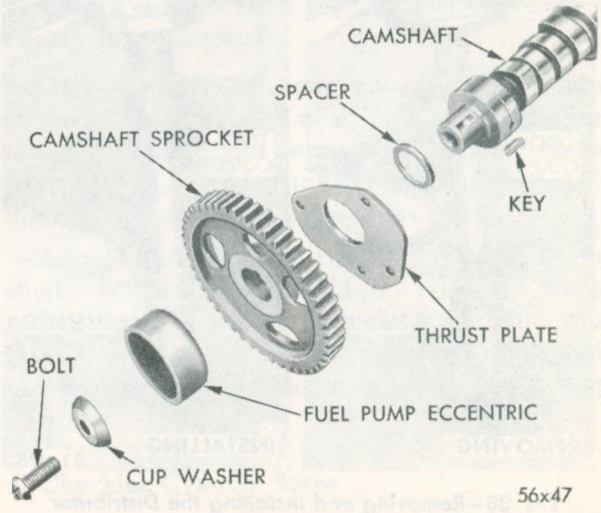

Fig. 37—Camshaft Drive Parts (Disassembled View)

ley over shaft and secure with bolts and lockwashers. Tighten bolts 15 foot-pounds torque. Install damper hub retainer washer and bolt. Tighten to 135 foot-pounds torque.

22. CAMSHAFT REMOVAL

With intake manifold, tappet cover, push rods, tappets and timing gears removed, remove distributor. Lift out distributor drive gear and stub shaft, (Fig. 36). Remove camshaft thrust plate attaching bolts and oil trough, (Fig. 37). Withdraw camshaft and spacer, **being careful not to damage the cam bearings with the cam lobes.**

23. REMOVAL AND INSTALLATION OF DISTRIBUTOR DRIVE SHAFT BUSHING (Camshaft Removed)

a. Removal

Insert Tool C-3052 into old bushing and thread down until a tight fit is obtained, (Fig. 38). Hold puller screw and tighten puller nut until bushing is removed.

b. Installation

Slide new bushing over burnishing end of Tool C-3053 and insert tool and bushing into bore. Drive bushing and tool into position, using a soft hammer. As the burnisher is pulled through bushing by tightening puller nut, the bushing is wedged tight in block and burnished to correct size. **DO NOT REAM THIS BUSHING.**

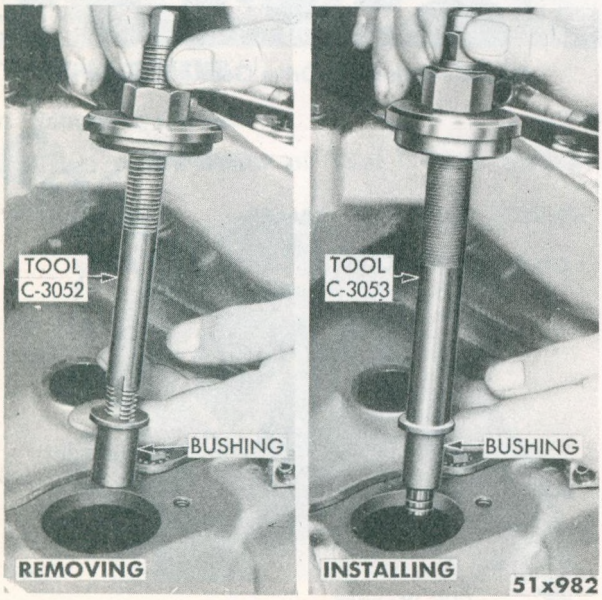

Fig 38—Removing and Installing the Distributor Drive Shaft Bushing

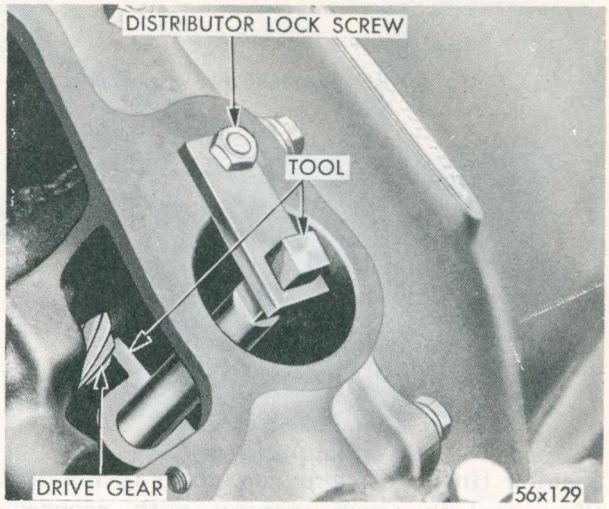

Fig. 39—Camshaft Holding Tool C-3509

24. CAMSHAFT INSTALLATION

Install Tool C-3509 in place of distributor drive gear and stub shaft (Fig. 39). Hold tool in position with distributor lock plate screw. This tool will restrict the camshaft from being pushed in too far and prevent knocking out the Welch plug, and **should remain installed until camshaft and crankshaft sprockets and timing chain have been installed.** Lubricate camshaft lobes and camshaft bearing journals and install camshaft **being careful not to damage cam bearings with the cam lobes.** Install thrust plate spacer (chamfered side toward camshaft fillet). Install thrust plate and oil trough; tighten screws 15 foot-pounds torque.

Check difference in thickness between spacer and thrust plate. The spacer should be thicker than thrust plate to extent that camshaft must have an end play of .002 to .006 inch.

NOTE: Whenever an engine has been rebuilt and a new camshaft and or new tappets have been installed, one quart of MOPAR Oil Additive should be added to the engine oil to aid break in. The oil mixture should be left in the engine for a minimum of 500 miles. However, it is not necessary to drain the mixture before normal oil change is required, nor is it necessary to use the oil additive at subsequent oil changes.

25. DISTRIBUTOR (BASIC) TIMING

Before installing the distributor drive shaft and gear, time engine as follows: Rotate crank-

shaft until Number One cylinder is at top dead center on Firing Stroke (check with Tool C-3075). When in this position, the pointer on chain case cover should be over ("DC") on vibration damper. Position oil pump shaft so that it lines up with slot in drive gear. Coat shaft of drive gear with engine oil. Install so that, after gear spirals into place, it will index with oil pump shaft, and slot in top of drive gear will be parallel with centerline of crankshaft (Fig. 36).

26. INSTALLATION OF DISTRIBUTOR

Hold distributor over mounting pad on cylinder block with vacuum chamber pointing toward right hand cylinder bank. Turn rotor until it points forward and to approximate location of Number One tower in distributor cap. Turn rotor counter-clockwise until breaker contacts are just separating. Place distributor oil seal ring in position. Lower distributor and engage shaft in slot of distributor drive shaft gear while holding rotor in position.

27. REMOVAL AND INSTALLATION OF CAMSHAFT BEARINGS (Engine Removed from Car)

a. Removal

With engine completely disassembled, drive out rear cam bearing Welch plug. Install proper size adapters and horse shoe washers (part of Tool C-3132) at back of each bearing shell to be removed and drive out bearing shells.

b. Installation

Install new camshaft bearings with Tool C-3132 by sliding new camshaft bearing shell over proper size adapter. Position bearing in tool (Fig. 40). Install horse shoe lock and by reversing removal procedure, carefully drive bearing shell into place. Install remaining shells in like manner. The oil holes in camshaft bearings and cylinder block must be in exact alignment to insure proper lubrication. (Fig. 40). Camshaft bearing index can be checked after installation by inserting a pencil flashlight in bearing shell. The complete circumference of camshaft bearing hole should be visible by looking through main bearing drilled oil passage. Another oil hole in cam bearings should be visible by looking down the left bank oil hole above and between No. 1 and 3 cylinders to

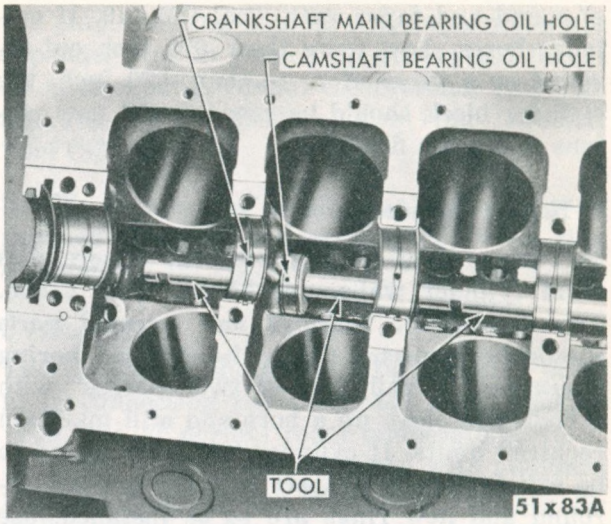

Fig. 40—Installing Camshaft Bearing Shells Using Tool C-3034

No. 2 cam bearing, and on the right bank above and between No. 6 and 8 cylinders to No. 4 cam bearing. If camshaft bearing shell oil holes are not in exact alignment, remove and reinstall. Use Tool C-897 to install a new Welch plug at rear of camshaft. Be sure this plug does not leak.

28. CYLINDER BLOCK

Clean cylinder block thoroughly, check all core hole plugs for evidence of leaking. If new core hole plugs are installed; coat edges of plug and core hole with a suitable sealer and drive plugs in place with driver, Tool C-897. Examine block for minute cracks or fractures. Remove top ridge of cylinder bores with a reliable ridge reamer before removing pistons from cylinder block. **Be sure to keep tops of pistons covered during this operation.**

NOTE: Pistons and connecting rods must be removed from the top of cylinder block. When removing piston and connecting rod assemblies from engine, rotate crankshaft so each connecting rod is centered in cylinder bore.

Remove connecting rod cap and bearing shells. Install Tool C-3221 on one connecting rod bolt and protector over the other bolts and push each piston and rod assembly out of cylinder bore. After removal, install bearing cap to mating rod.

a. Checking Cylinder Bores

The cylinder bores should be checked for out-

of-round and taper with Tool CM-119. If cylinder bores show more than .005 inch out-of-round or a taper of more than .020 inch, the cylinder block should be rebored and new pistons and rings fitted.

b. Honing Cylinder Bores

To remove light scoring, scuffing, or scratches from cylinder walls, use honing Tool C-823. **The crankshaft, bearings and internal parts should be protected during honing and boring operations.** Usually one or two "passes" with a hone will clean up a bore and still maintain required limits. If cylinder bores are found to be satisfactory in respect to taper and out-of-round and new rings are to be installed, use cylinder surfacing hone Tool C-3501 with 280 grit stones for deglazing bores. This will facilitate in the break-in of new rings.

CAUTION

Be sure all abrasives are removed from engine parts after honing. It is recommended that a solution of soap and water be used with a brush and then thoroughly dried. If this is impossible use SAE No. 10 oil and CLEAN rags. When the bore can be wiped with a clean white rag and be withdrawn clean, the bore is clean.

c. Cylinder Walls

Cylinder walls which are badly scored, scuffed, scratched, or worn beyond specified limits should be rebored. Whatever type of boring equipment is used, boring operation should be closely co-ordinated with the fitting of pistons and rings, in order that specifications may be maintained.

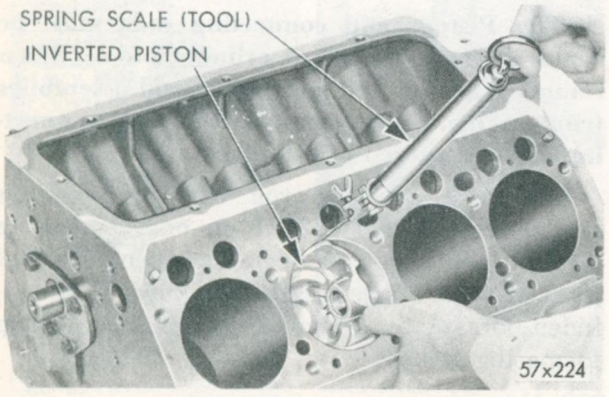

Fig. 41—Fitting Piston to Cylinder Bore (FirePower) (Typical of SpitFire)

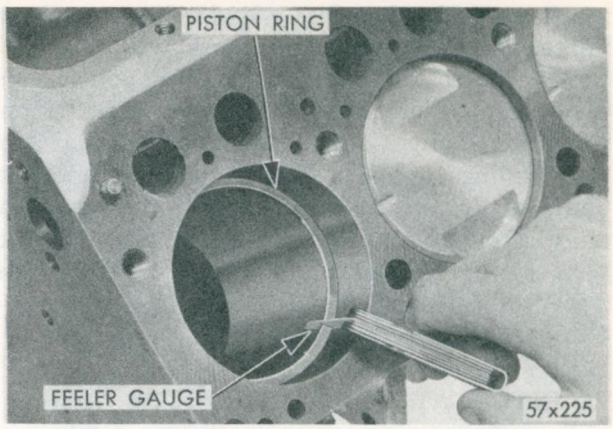

Fig. 42—Checking Ring Gap in Cylinder Bore (FirePower) (Typical of SpitFire)

d. Fitting Pistons

The piston and cylinder wall must be clean and dry. Coat the bore very lightly with SAE 10 W Engine Oil. The recommended clearance between the thrust face of piston and cylinder wall is .005 to .0015 inch. Check clearance with a .002 inch feeler stock ½ inch wide on spring scale Tool C-690, by inserting piston in bore, upside down, with feeler stock between thrust face of piston and cylinder wall. Hold piston and draw the feeler stock straight out with spring scale (Fig. 41). The amount of pull required to withdraw the feeler stock should be 8 to 12 pounds.

NOTE: Piston fitting should be done at normal room temperature, 70° F.

All service pistons include piston pins and retaining rings and are available in standard

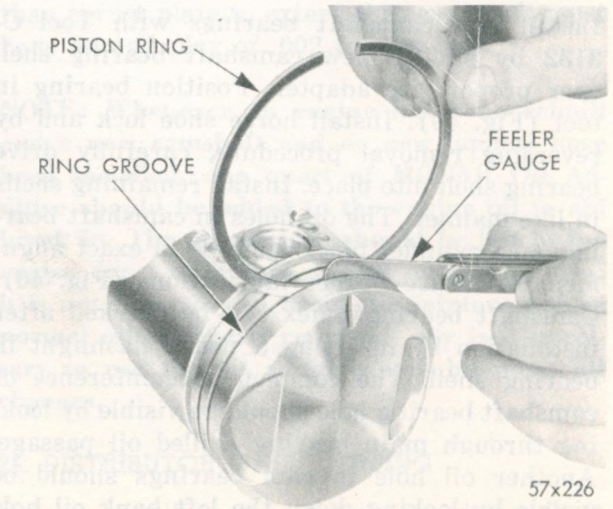

Fig. 43—Checking Piston Ring Side Clearance

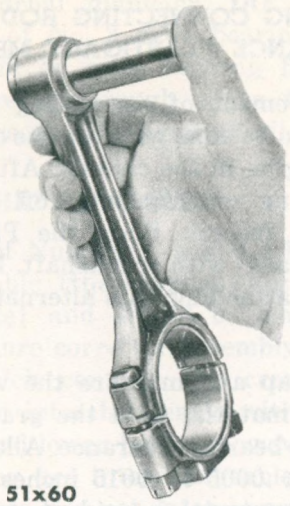

Fig. 44—Fitting Piston Pins in Connecting Rod

and the following oversizes, .005, .020, .040 and .060 inch, (C-75 only).

e. Fitting Rings

Measure piston ring gap about two (2) inches from bottom of cylinder bore in which it is to be fitted. (An inverted piston can be used to push the rings down to position.) This will insure positioning rings exactly square with cylinder wall before measuring. Insert feeler stock in gap (Fig. 42). The ring gap should be between .010 to .020 inch. This measurement is the same for all rings. Measure clearance between piston ring and ring groove (Fig. 43). The clearance should be .0015 to .0030 inch for top compression ring, .001 to .0025 inch for intermediate ring, and .001 to .003 for oil control ring. Starting with oil ring expander, place expander ring in lower ring groove and install oil control ring. Install compression rings, in top and middle grooves. Use ring installer, Tool C-3418.

NOTE: Be sure the mark "Top" on each compression ring is to the top of piston when ring is installed.

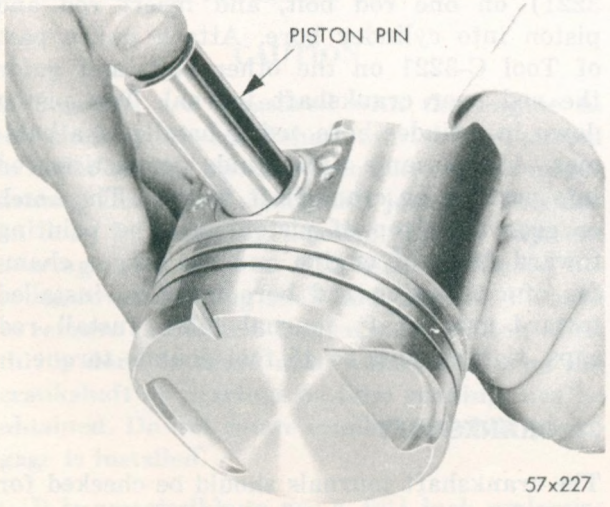

Fig. 45—Fitting Piston Pin in Piston (Typical)

f. Fitting Pins

The piston pin should be a tight thumb press fit in connecting rod (Fig. 44) and in piston (Fig. 45) at normal room temperature, 70°F. If proper fit cannot be obtained with standard pins, ream piston and connecting rod, and install oversize piston pin. Piston pins are supplied in standard and the following oversizes: .003 and .008 inch. Assemble pistons to rods on right cylinder bank (2, 4, 6, and 8), with the indent on piston head opposite to the larger chamfer on the large end of connecting rod. Assemble pistons to rods on left cylinder bank (1, 3, 5, and 7) with the indent on the piston head on the same side as the larger chamfer on large end of connecting rod.

29. CONNECTING RODS

IMPORTANT

A Maltese Cross stamped on the engine numbering pad (Fig. 46) indicates that engine is equipped with a crankshaft which has one or more connecting rods and main bearing journals finished .001 inch undersize. The position

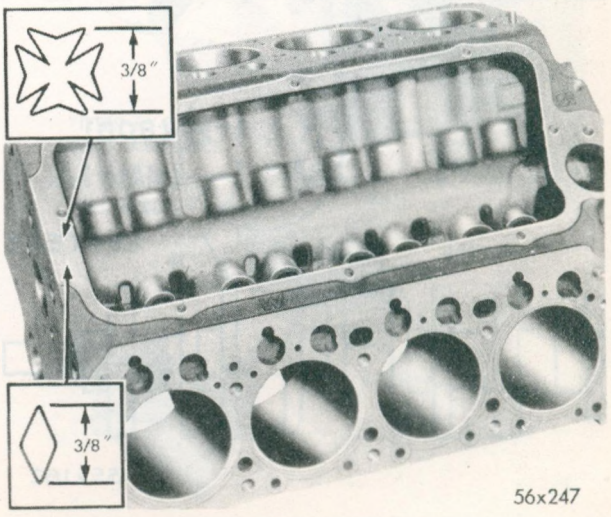

Fig. 46—External Identification (Parts other than standard size)

of the undersize journal or journals will be stamped on machined surface of Number 3 counter-weight (Fig. 47). Connecting rod journals will be identified by letter "R" and main bearing journals by the letter "M". Thus, "M-1" indicates that Number 1 main bearing journal is .001 undersize. Also, a diamond-shaped marking stamped on engine numbering pad indicates that All tappet bodies are .008 inch oversize. (See Fig. 46).

30. INSTALLING CONNECTING ROD BEARINGS

NOTE: Fit all rods of one bank until completed. Do not alternate from one bank to another, because when rods are assembled to pistons correctly, they are not interchangeable from one bank to another.

Each bearing cap has a small "V" groove across the parting face. When installing the lower bearing shell, make certain that "V" groove in shell is in line with "V" groove in cap. This allows lubrication of the cylinder wall. The bearing shells should always be installed so that small formed tang fits into machined grooves of rods. The side play should be from .006 to .014 inch (two rods).

Limits of taper or out-of-round on any crankshaft journals should be held to .001 inch. Bearings are available in .001, .002, .003, .010 and .012 undersize.

NOTE: Install bearings in pairs. Do not use a new bearing half with an old bearing half. Do not file rods or bearings caps.

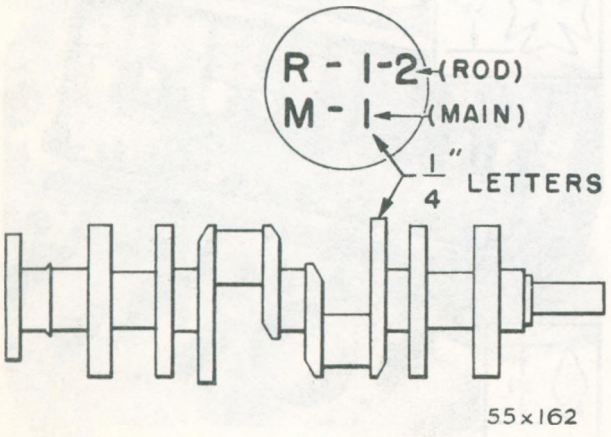

Fig. 47—Internal Identification (Parts other than standard size)

31. CHECKING CONNECTING ROD BEARING CLEARANCE (PLASTIGAGE METHOD)

The measurement of connecting rod bearing clearance can be done with the use of Plastigage with the engine in the chassis. After removing the connecting rod cap, wipe off oil from the journal and inserts. Place the Plastigage on bearing, parallel with crankshaft. Reinstall cap and tighten attaching nuts alternately to specified torque.

Remove cap and measure the width of the compressed material with the graduated scale to determine bearing clearance. Allowable clearance is from .0005 to .0015 inches. If taper of compressed material is evident, measure with the graduated scale. If difference exceeds .001 inch, journal should be checked with micrometers.

32. INSTALLING PISTON AND CONNECTING ROD ASSEMBLY IN CYLINDER BLOCK

Before installing pistons, rods, and rod assemblies in bore, be sure that compression ring gaps are diametrically opposite one another and not in line with oil ring gap. The oil ring expander gap should be toward the outside "V" of engine. The oil ring gap should be turned toward the inside of the "V" of engine. Immerse piston head and rings in clean engine oil, slide ring compressor, Tool C-385, over piston, and tighten with special wrench (part of Tool C-385). Be sure position of rings does not change during this operation. Screw connecting rod bolt protector (part of Tool C-3221) on one rod bolt, and insert rod and piston into cylinder bore. Attach puller part of Tool C-3221 on the other bolt, and guide the rod over crankshaft journal. Tap piston down in cylinder bore, using handle of a hammer. At the same time, guide connecting rod into position on crankshaft journal. The **notch or groove** on top of piston **must** be pointing toward front of engine and the larger chamfer of connecting rod bore must be installed toward crankshaft journal fillet. Install rod caps, tighten nuts to 45 foot-pounds torque.

33. CRANKSHAFT

The crankshaft journals should be checked for excessive wear, taper and scoring. Journal grinding should not exceed .012 inch under the

standard journal diameter. **DO NOT** grind thrust faces of No. 3 main bearing. **DO NOT** nick crankpin or main bearing fillets. After regrinding remove rough edges from crankshaft oil holes and clean out all oil passages.

34. CRANKSHAFT BEARINGS

The halves of Number 1, 2 and 4 bearings are interchangeable (the bearing caps are not interchangeable) and should be marked at removal to insure correct reassembly. Number 3 bearing, which controls the crankshaft end thrust, is not interchangeable with the others. The upper and lower halves, however, of Number 3 bearing are interchangeable. Number 5 bearing halves are not interchangeable. Bearing shells are available in standard and the following undersizes: .001, .002, .003, .010 and .012 inch. Never install an undersize bearing shell that will reduce the clearance below specifications.

35. REMOVAL AND INSTALLATION OF MAIN BEARINGS

a. Removal

Remove oil pan and mark bearing caps before removal. Remove bearing caps one at a time. Remove upper half of bearing by inserting Tool C-3059 (Fig. 48) in oil hole of crankshaft. Slowly rotate crankshaft clockwise, forcing out upper half of bearing shell.

b. Checking Main Bearing Clearance

PLASTIGAGE METHOD. Use same technique as described in Paragraph 31.

CAUTION

If bearings are measured with the engine in the chassis, the crankshaft must be supported in order to take up clearance between the upper bearing insert and crankshaft journal. This can be done by snugging bearing caps of adjacent bearings with .005 to .015 inch cardboard between lower bearing shell and journal. Be sure to remove cardboard. Use extreme caution when this is done to avoid unnecessary strain on the crankshaft or bearings or false reading may be obtained. Do not rotate crankshaft while plastigage is installed.

It is permissible to use a .001 inch undersize bearing with a standard bearing or a .002 inch bearing. Always use the smaller diameter bearing half as the upper housing half. Never use a new bearing with used bearing and never use an upper bearing half more than .001 inch smaller than the lower bearing half.

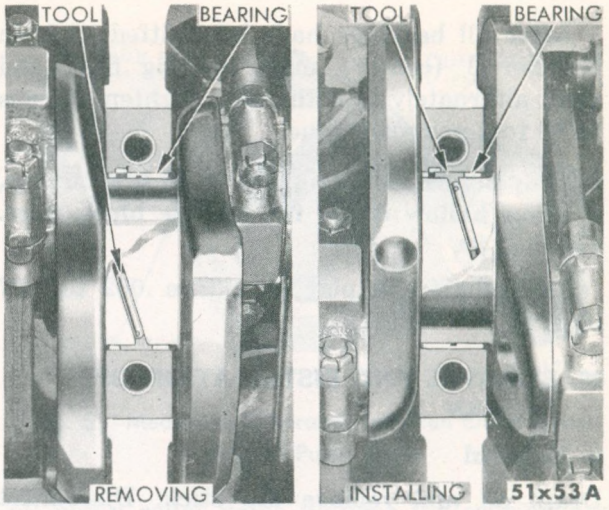

Fig. 48—Removing and Installing Main Bearing Upper Shell

c. Installation

NOTE: When installing a new upper bearing shell, slightly chamfer the sharp edge from plain side.

Start bearing in place, and insert Tool C-3059 in oil hole of crankshaft (Fig. 48). Slowly rotate the crankshaft counter-clockwise, sliding bearing into position.

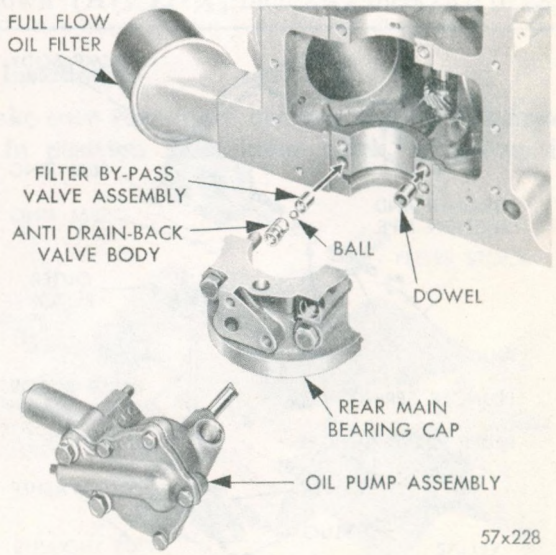

Fig. 49—Installing By-Pass Valve — Rear Main Bearing Cap

After all bearings have been fitted, tighten Number 3 (center) main bearing first, and work alternately to both ends. Tighten all caps to 85 foot-pounds torque.

NOTE: Before installing rear main bearing cap, position hollow dowel in cylinder block bore. See Fig. 49.

Crankshaft end play should be .002 to .007 inch.

36. REMOVAL AND INSTALLATION OF OIL PAN

a. Removal

Drain oil and remove dip stick. Disconnect crossover and "Y" pipe at exhaust manifolds and at clamp to exhaust extension so that crossover and "Y" pipe may be moved out of way. Remove the converter dust shield. **Be sure the rest of exhaust system is sufficiently supported.** Remove starter. Remove nuts from front engine mounts and hoist engine ¾ inch. Rotate the crankshaft until the front counterweight is up (this is done when the timing mark is 180° from the timing pointer. Disconnect steering linkage at idler arm support bracket, and allow linkage to settle away from bottom of pan. Remove bolts that hold pan to cylinder block and remove pan.

b. Installation

Clean pan thoroughly and install new seals and gaskets. **End seals should be bottomed in their grooves and retained by crimping.** Ends of seals should extend approximately 1/32 inch higher than the attaching face of oil pan to insure proper sealing. Tighten bolts evenly to 15 foot-pounds torque. Install exhaust pipes and connect steering linkage. Refill crankcase. See "Lubrication", Section XV.

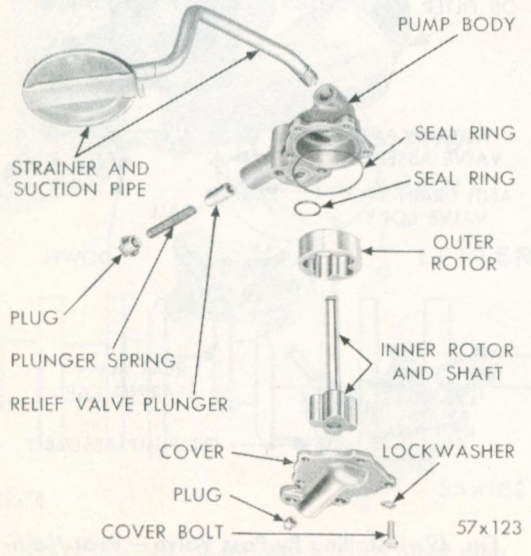

Fig. 50—Oil Pump (Disassembled View)

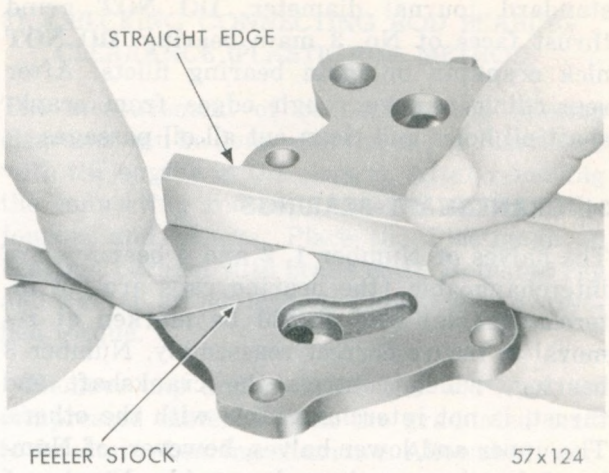

Fig. 51—Checking Oil Pump Cover

37. OIL PUMP

a. Removal

Remove oil pan, oil pump attaching bolts and remove pump by pulling straight down.

b. Disassembly (Fig. 50)

Remove oil pump cover and oil seal ring. Remove pump rotor and shaft, and lift out pump rotor body. Remove oil pressure relief valve plug, and lift out spring and plunger.

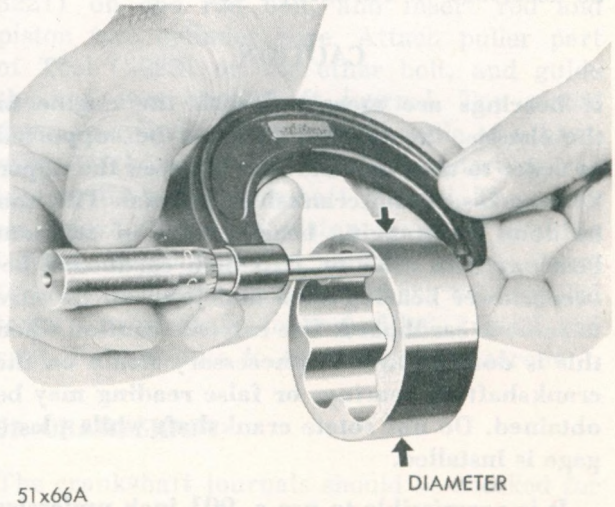

Fig. 52—Measuring Thickness of Outer Rotor

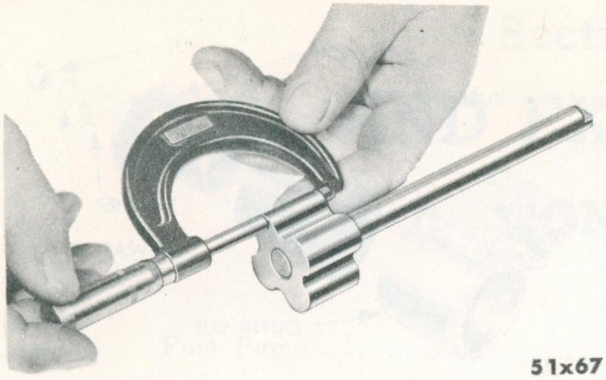

Fig. 53—Measuring Thickness of Pump Rotor

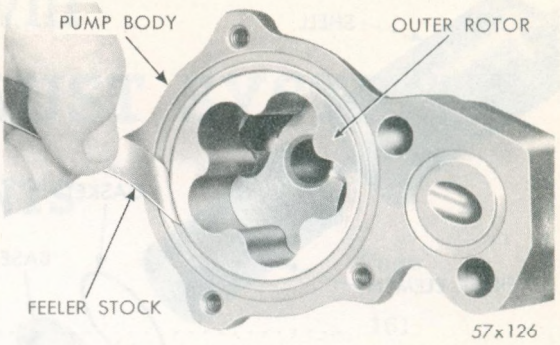

Fig. 55—Measuring Clearance between Outer Rotor and Oil Pump Body

c. Inspection and Repair

Wash all parts thoroughly. The mating face of oil pump cover should be smooth. Replace cover if it is scratched or grooved.

Lay a straightedge across cover surface (Fig. 51). If a .0015 inch feeler gauge can be inserted between cover and straightedge, the cover should be replaced. If outer rotor measures less than .998 inch (Fig. 52) and diameter less than 2.244 inches, replace outer rotor. If pump rotor measures less than .998 inch (Fig. 53) a new pump rotor should be installed. Slide outer rotor and rotor into pump body and place a straightedge across face (between bolt holes), as shown in Figure 54. If a feeler gauge of more than .004 inch can be inserted between rotors and straightedge, replace pump body. Remove pump rotor and shaft, leaving outer rotor in pump cavity. Press rotor body to one side with fingers and measure clearance between outer rotor and pump body, (Fig. 55). If measurement is more than .012 inch, replace oil pump body. If clearance between pump rotor and outer rotor (Fig. 56) is more than .010 inch, replace pump rotor and outer rotor. Check oil pump relief valve plunger for scoring and for free operation in its bore. If plunger is scored, replace plunger. The spring should conform to Specifications on chart. If, for any reason, the spring has to be replaced, the same color spring should be used. An exception is where oil pressure is either above or below specifications. When assembling oil pump, be sure to use a new oil seal ring between cover and body. Tighten cover bolts to 10 foot-pounds torque. Prime the oil pump.

RELIEF VALVE SPRING CHART

Color	Free Height	Under Load Height	Tension Pounds
Gray (Lt.) . . .	3 1/32 inch	2 1/16 inch	16.1 to 17.1
Red (Std.) . . .	2 27/32 inch	2 1/16 inch	19.5 to 20.5
Brown (Hvy.)	2 31/32 inch	2 1/16 inch	22.0 to 23.9

d. Installation

Make sure rear main bearing cap hollow dowel is in position in cylinder block, as shown in

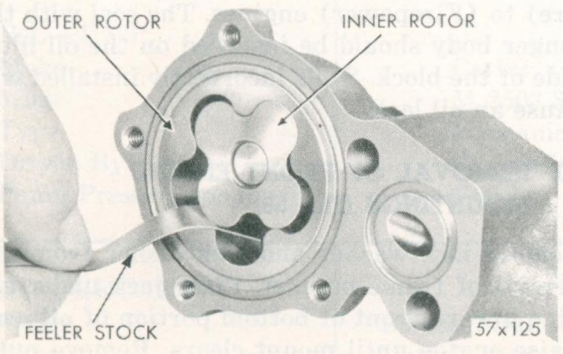

Fig. 54—Measuring Clearance over Oil Pump Rotor

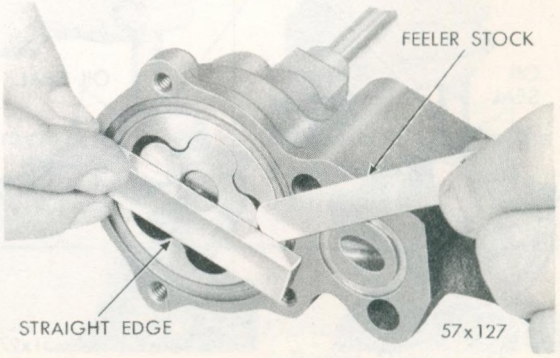

Fig. 56—Measuring Clearance Between Pump Rotors

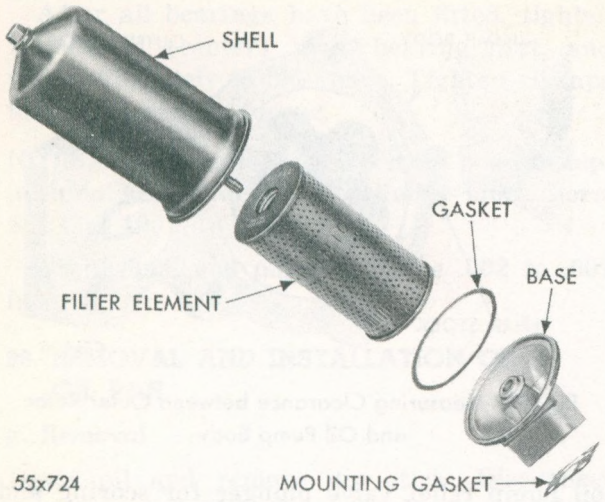

Fig. 57—Full Flow Type Oil Filter (Disassembled View)

Figure 49. Align tang on oil pump shaft with slot on distributor lower drive shaft. Install oil pump to rear main bearing cap. Tighten mounting bolts to 33 foot-pounds torque.

After oil pump has been installed, check alignment of strainer. The bottom of strainer must be on a horizontal plane with machined surface of cylinder block. The foot on the strainer should touch bottom of oil pan.

38. REMOVAL AND INSTALLATION OF OIL FILTER

Remove the shell retaining center bolt and lift off outer shell and gasket. (Fig. 57). Remove filter element. Remove filter base attaching bolts and filter base if necessary.

Use new gaskets, reinstall filter base and new filter element. Install outer shell and tighten center bolt securely.

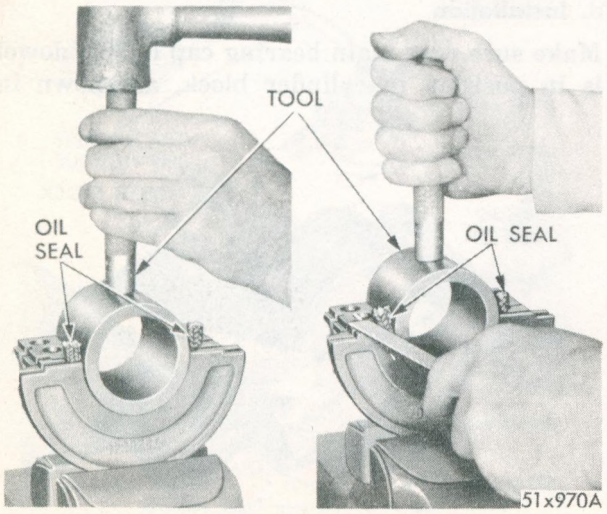

Fig. 58—Installing Rear Main Bearing Oil Seal

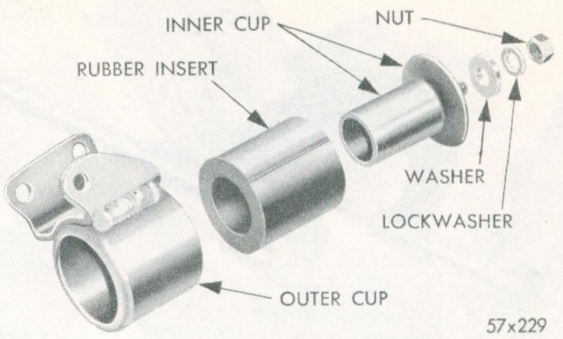

Fig. 59—Front Engine Mounting (Disassembled View)

NOTE: FirePower Engine—Remove air cleaner. Loosen oil filter. Raise car. Remove filter from below car.

39. REPLACEMENT OF REAR MAIN BEARING OIL SEAL (Crankshaft removed)

Remove old oil seals from cylinder block and bearing cap. Install a new rear main bearing oil seal in block so that both ends protrude. Tap seal down into position using Tool C-3574 on the FirePower Engines and Tool C-3020 on the SpitFire Engines until tool is seated in bearing bore. Hold tool in this position, and cut off portion of seal that extends above block on both sides.

Install a new seal in bearing cap (bearing shell removed) so that the ends protrude. (Fig. 58). Tap seal down into position with Tool C-3511 (left-hand view), until tool is seated. Trim off portion of seal that protrudes above cap (right-hand view). Install two cap side seals in grooves in cap. Care should be used when installing these seals as they are **NOT** interchangeable from left to right or from (Spitfire) to (Firepower) engines. The seal with the longer body should be installed on the oil filter side of the block. Seals incorrectly installed will cause an oil leak.

40. REMOVAL OF FRONT ENGINE MOUNTINGS (Fig. 59)

Remove nut, washer and lockwasher from underside of frame bracket. Place jack under engine toward front of bottom portion of **oil pan.** Raise engine until mount clears. Remove nuts, bolts from each mount.

Section VIII

FUEL AND EXHAUST SYSTEM

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DATA AND SPECIFICATIONS

Model	C-75-1	C-75-2	C-76, 1M 1, 2 & 4
FUEL PUMP			
Make	Carter		Carter
Model	M 2503 S		M 2503 S
Type	Mechanical Diaphragm		Mechanical Diaphragm
Driven By	Camshaft		Camshaft
Pump Pressure (pounds)	6 to 7		6 to 7
CARBURETOR			
Make	Ball and Ball		Carter
Type	Dual Downdraft		4 Barrel Downdraft
Model	BBD-2527S	WCFB 2589S	WCFB 2590S
Nominal Size	1¼" Dual 4 Bolt		1¼" 4 Bore 4 Bolt

DATA AND SPECIFICATIONS (Cont'd)

Model	C-75-1 C-75-2	C-76, IM 1, 2 & 4
ADJUSTMENTS		
Idle Mixtures (both screws)	One Full Turn Open	One Full Turn Open
Idle Speed	500 r. p. m.	500 r. p. m.
Accelerator Pump	1″ + or − 1/64	Middle Stroke
Float Setting (Casting to top of floats)		
Primary	1/4″ inch	5/32 inch
Secondary	——	9/32 inch
Float travel	——	1/2″ + or − 1/16″
Unloader	3/16 inch	3/16 inch
Fast Idle	.016 inch	.012 inch
CHOKE ROD ADJUSTMENT	——	.020 inch
CHOKE		
Control	Integral Automatic	Integral Automatic
Setting	Standard Setting—1 Notch Rich	

SPECIAL TOOLS FUEL PUMP

C-483	Gauge
T-109-210	Rivet Extractor

SPECIAL TOOLS CARBURETOR

C-3225	Stand, Carburetor Repair
C-3400	Stand, Carburetor Repair
T-109-22	Bend Tool, Fast Idle Cam Adjustment
T-109-28	Gauge, Unloader—3/16 inch
T-109-29	Gauge, Wire Cam, .020 inch
T-109-31	Gauge, Unloader—(1/4 inch)
T-109-41	Bending Tool
T-109-44	Wire Gauge, Fast Idle (.015 to .018 inch)
T-109-58	Bit, Screwdriver
T-109-193	Gauge, Wire (.040 and .054 inch)
T-109-197	Gauge, Bowl Vent Cap
T-109-200	Gauge, Wire (.010 and .012 inch)
T-109-213	Bending Tool.
T-109-214	Bending Tool
T-109-236	Gauge Float Level (5/32″)
T-109-237	Thickness (.005 inch)
T-109-282	Gauge, Float Setting
T-109-284	Guage, Float Level (9/32″)

Section VIII

FUEL AND EXHAUST SYSTEM

FUEL PUMP

The fuel pump is driven by an eccentric on the camshaft, which actuates the rocker arm. This action lifts the pull rod and diaphragm assembly upwards against main spring, thus creating a vacuum in the valve housing, which opens the inlet valve and fuel is drawn into valve housing chamber from fuel tank.

On return stroke of rocker arm, the main spring pressure forces the diaphragm to down position, which expels fuel in valve chamber through outlet valve, to carburetor.

When carburetor float chamber is filled with fuel, the float in carburetor shuts off the needle valve, creating pressure in fuel pump chamber. This pressure holds fuel pump diaphragm upward against spring pressure until carburetor requires more fuel.

As engine consumes fuel the float level in the carburetor bowl drops and needle valve opens to admit fuel into float chamber, which releases the pump pressure and starts the pumping cycle again. Actually, change in float level is negligible.

1. TESTING FUEL PUMP (On Car)

If fuel pump fails to pump fuel to carburetor, following checks should be made to determine cause of failure before removing fuel pump from car:

a. Fuel Lines

Make certain that fuel lines are not blocked and that fittings are tight. Check flexible hoses for cracks or deterioration which would cause leakage or retard flow of fuel to fuel pump.

b. Fuel Pump Breather Hole

Check for gasoline or oil leakage at fuel pump breather hole. A gosoline leak at this point indicates a defective diaphragm. An oil leak at this point indicates presence of a deteriorated or damaged oil seal on the diaphragm pull rod. In either case, the diaphragm assembly should be replaced.

c. Fuel Pump Pressure

If leakage is not apparent at fuel pump breather hole, test fuel pump pressure by inserting "T" fitting into fuel line at carburetor. Connect pressure gauge, Tool C-483, to "T" fitting and check fuel pump pressure while rotating the engine.

Fuel pump pressure should be from 6 to 7 pounds. This pressure should remain constant, or return to zero very, very slowly when engine is stopped. An instant drop to zero on the testing gauge indicates that outlet valve is leaking. Inlet and outlet valves are not serviceable. If necessary, replace the complete valve housing assembly.

If the Pressure Is Too Low—A weak diaphragm main spring, or improper assembly of diaphragm, may be the cause.

2. INLET VALVES

To test the inlet valves for proper functioning, disconnect fuel line to fuel pump and start engine, or turn engine with starting motor. Place finger over inlet fitting of fuel pump while engine is turning. There should be a noticeable suction—not alternated by blow-back—at this point. If blow-back is present, one or both inlet valves are not seating properly. The inlet and outlet valves are not serviceable. If necessary, replace the complete valve housing assembly.

Additional Checks

Check for leakage at fuel pump diaphragm which might be caused by loose mounting screws. Check fuel pump mounting bolts to insure that no oil leakage exists around mounting flange. If fuel pump fails to operate satisfactorily, disconnect fuel pump inlet and outlet lines and remove fuel pump assembly from engine. (On cars equipped with air conditioning remove fuel pump from bottom side of engine compartment).

SERVICE PROCEDURES

3. SERVICING THE FUEL PUMP (FIG. 1)

Before disassembling the fuel pump, mark housings and air dome in such a manner that they may be reassembled with inlet and outlet fitting holes in correct location. Remove rocker arm follower spring by prying up and over dimple in housing. Remove pivot pin plug, using plug removing Tool T-109-43. Remove hairpin clip from groove in pivot pin. Remove pin and slide rocker arm out of rocker arm housing. Remove screws that hold valve housing to rocker arm housing. Separate housings and remove diaphragm assembly. Remove screws that attach air dome to valve housing. Separate dome from housing.

4. CLEANING AND INSPECTION

Clean all parts (except diaphragms) in solvent, then blow dry with compressed air. Examine diaphragm for cracks, torn screw holes or ruptures. Check condition of rubber oil seal on pull rod. If deteriorated, install new diaphragm and pull rod assembly. Check strainer screen in bottom of valve housing. If corroded or clogged, install new screen. Check rocker arm for wear or scoring on position that contacts eccentric on camshaft. If arm is scored or worn, install new rocker arm.

The component parts of inlet and outlet valves are not available for service. If new valves are required, install new valve housing assembly.

5. ASSEMBLING THE FUEL PUMP (FIG. 1)

NOTE: When reassembling the fuel pump do not use shellac or other adhesive on either of the two diaphragms.

Install strainer screen in position in valve body. Place rubber diaphragm over air dome with the cut-out position over strainer. (Be sure the inlet fitting hole is in correct position under cut-out in diaphragm). Install screws and tighten securely. Place diaphragm assembly over valve body, then align screw holes. Lower rocker arm housing down on diaphragm. Align screw holes. Check for positioning marks. Compress slightly and tighten screws alternately. Install rocker arm with slot directly under pull rod washer and gasket. Slide pivot pin through housing and lever until centered. Install hairpin clip and plug. Place end of follower spring over tang in lever, compress slightly and slide over dimple in housing.

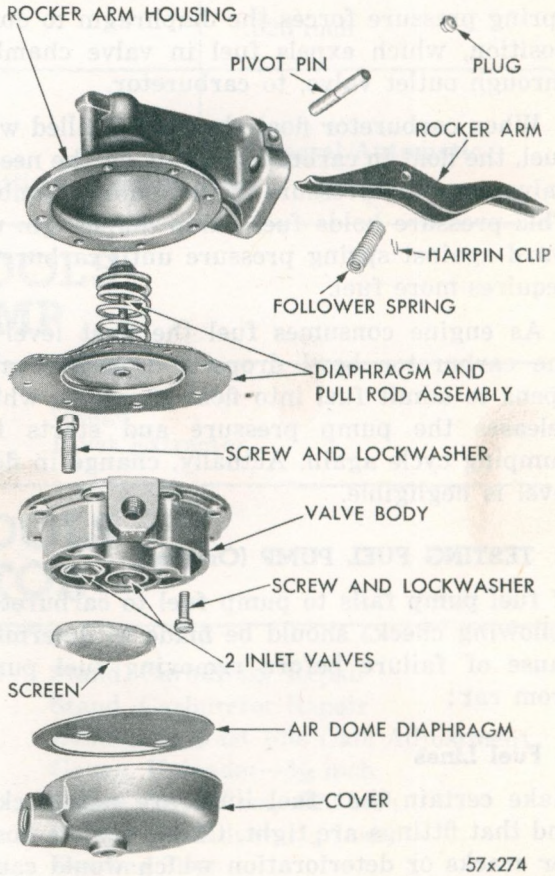

Fig. 1—Fuel Pump (Disassembled View)

SERVICE DIAGNOSIS

6. FUEL PUMP LEAKS—FUEL

a. Tighten loose housing screws.

b. Install new diaphragm

c. Tighten loose inlet or outlet fuel fittings.

7. FUEL PUMP LEAKS—OIL

a. Install new diaphragm.

b. Tighten fuel pump mounting bolts.

c. Install new pump to block gasket.

d. Install new pull rod oil seal.

8. INSUFFICIENT FUEL DELIVERY

a. Tighten fuel line fittings.

b. Install new diaphragm.

c. Thaw out frozen fuel lines.

d. Install new valve body.

e. Install correct fuel pump.

9. FUEL PUMP NOISE

a. Tighten fuel pump mounting bolts.

b. Install new rocker arm.

c. Install new rocker arm follower spring.

d. Lubricate at rocker arm pivot and pull rod with Lubriplate.

CARBURETORS

MODELS BBD-2527S (MODEL C-75-1)

The Ball and Ball (BBD) (Fig. 2) series carburetors are of the dual downdraft type. Each throat has its own throttle valve, idle and main metering systems and are supplemented by the float, accelerating and power systems.

10. CARBURETOR MODEL IDENTIFICATION

On each BBD series carburetor, model number is stamped on metal tag attached to air horn. Do not remove or destroy this tag, as it is the only means provided for carburetor model identification. Before attempting to repair or overhaul carburetor, refer to model number and secure a repair kit for number indicated on tag.

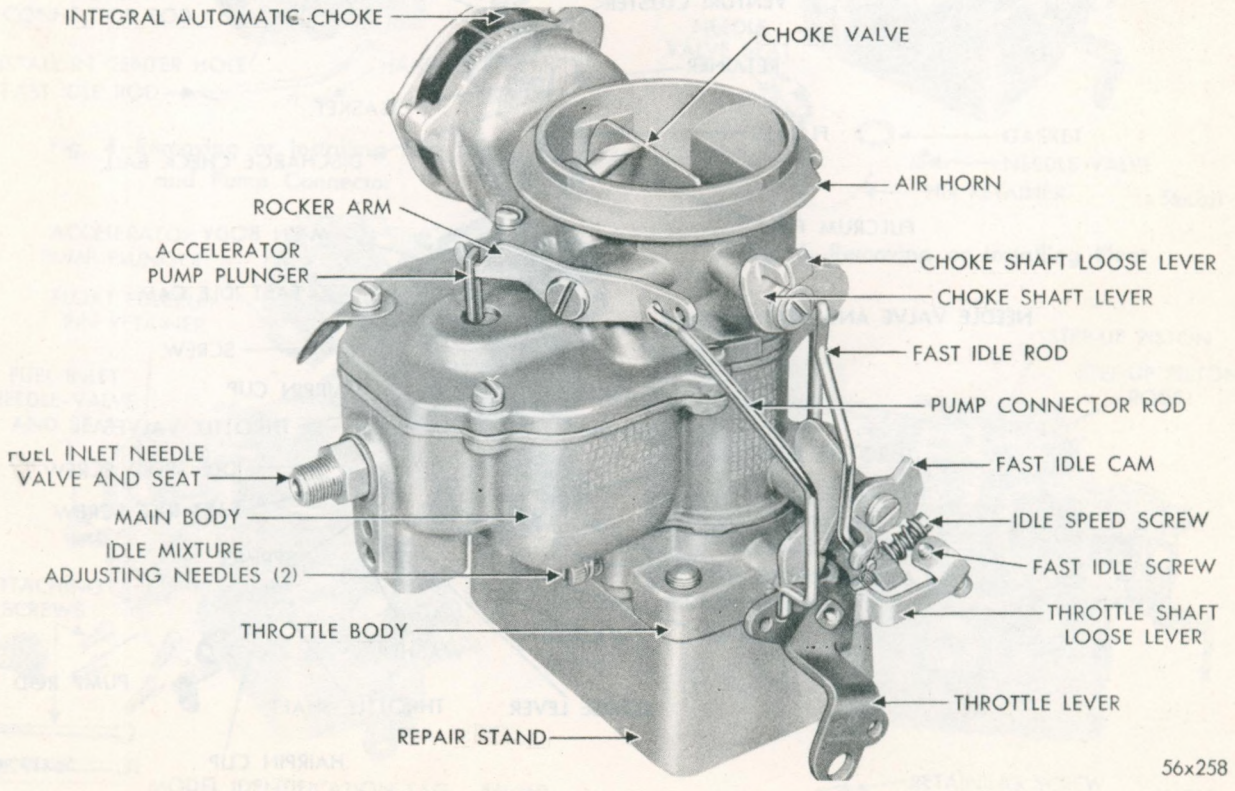

Fig. 2—Carburetor Assembly (BBD-2527S)

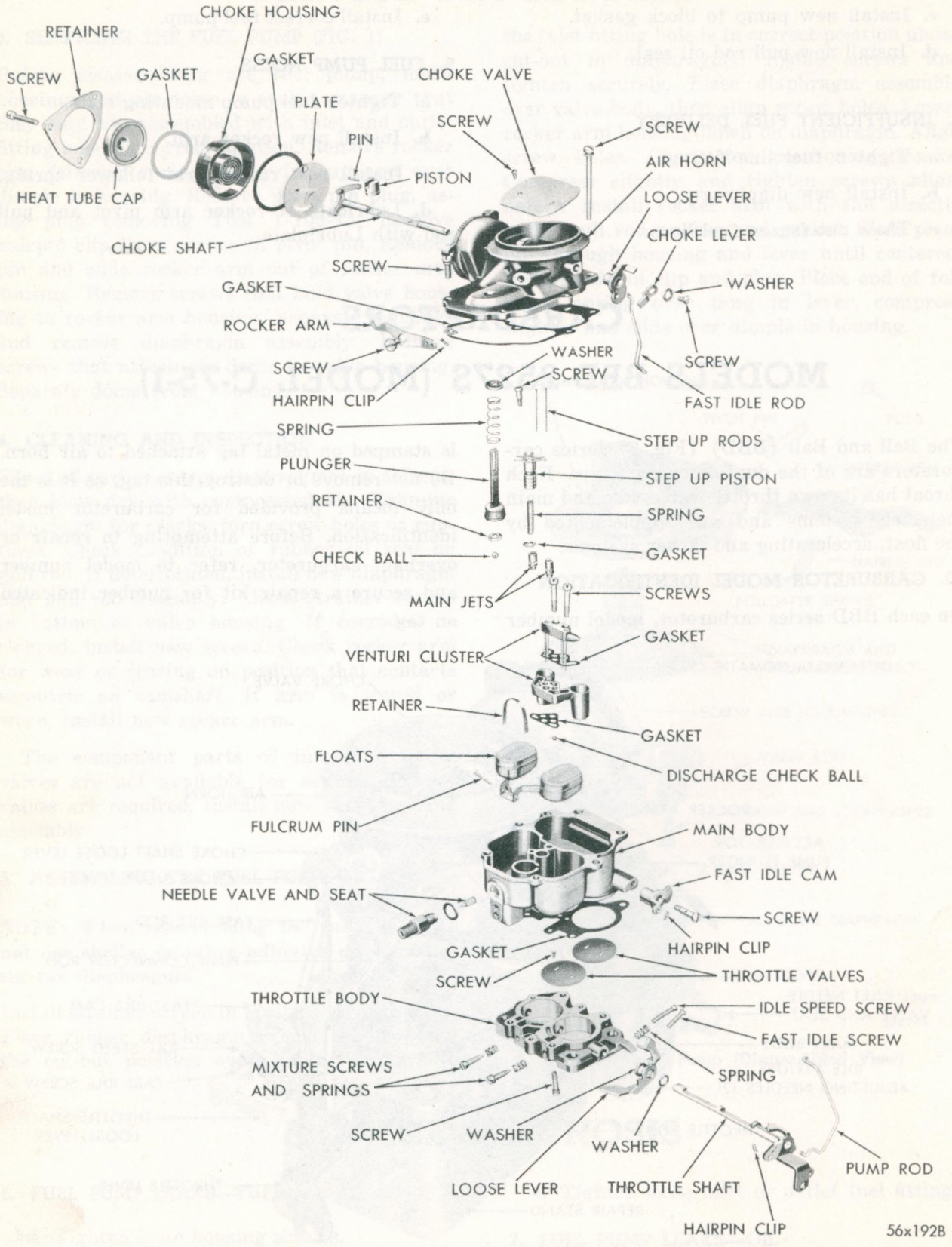

Fig. 3—Carburetor Assembly (BBD-2527S) (Disassembled View)

SERVICE PROCEDURES

11. REMOVAL OF CARBURETOR FROM ENGINE

Remove air cleaner, gasket, fuel line, choke heat tube and vacuum spark advance tube. Disconnect throttle linkage, remove the carburetor from intake manifold. Discard mounting flange gasket.

The carburetor must be disassembled, all parts carefully cleaned in suitable solvent, such as "Metalclene" or equivalent. Inspect all parts for damage or wear and replace as necessary.

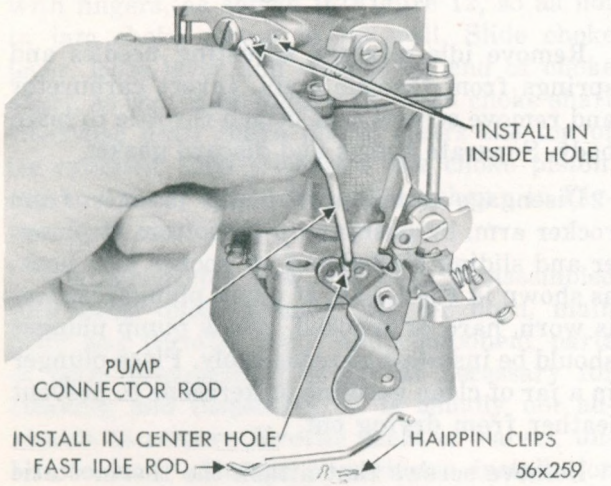

Fig. 4—Removing or Installing Fast Idle and Pump Connector

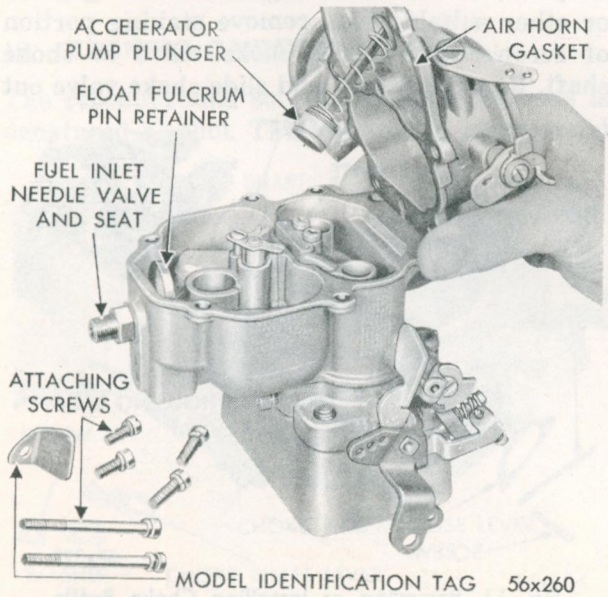

Fig. 5—Removing or Installing Air Horn

12. CARBURETOR DISASSEMBLY (FIG. 3)

Place carburetor assembly on repair stand Tool C-3225, (if available). This Tool is used to protect throttle valves from damage and provide a suitable base for working. Remove hair pin clips that retain fast idle and pump connector rods, disengage from choke and throttle levers, as shown in Figure 4. Remove air horn and integral automatic choke, as shown in Figure 5, discard gasket. Remove fuel inlet needle valve, seat, gasket and float fulcrum pin retainer. Lift out floats, as shown in Figure 6. Remove step-up piston screw, lift step-up piston and rods up out of carburetor

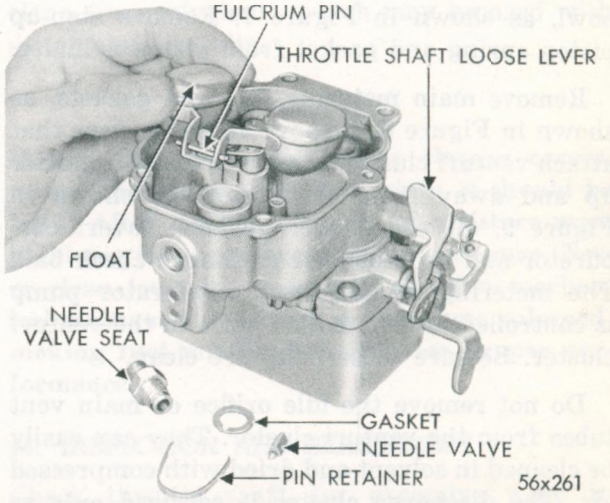

Fig. 6—Removing or Installing Float

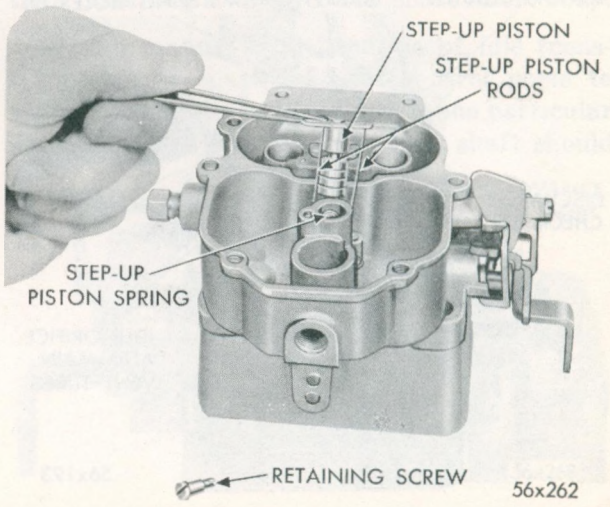

Fig. 7—Removing or Installing Step Up Piston and Rods

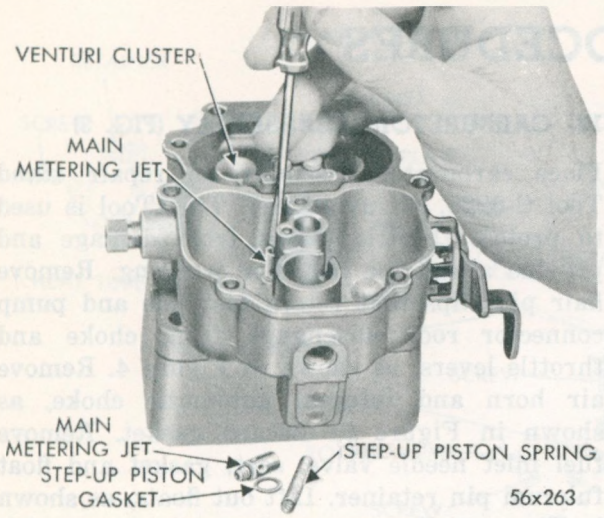

Fig. 8—Removing or Installing Main Metering Jets

bowl, as shown in Figure 7. Remove step-up piston spring and gasket from piston cylinder.

Remove main metering jets and gaskets, as shown in Figure 8. Remove vented screws that attach venturi cluster to main body. Lift cluster up and away from carburetor, as shown in Figure 9, discard cluster gaskets. Invert carburetor and drop out the discharge check ball. The metering of fuel from accelerator pump is controlled by two drilled holes in the venturi cluster. Be sure these holes are clean.

Do not remove the idle orifice or main vent tubes from the venturi cluster. They can easily be cleaned in solvent and dried with compressed air. The discharge cluster is serviced **only** as an assembly.

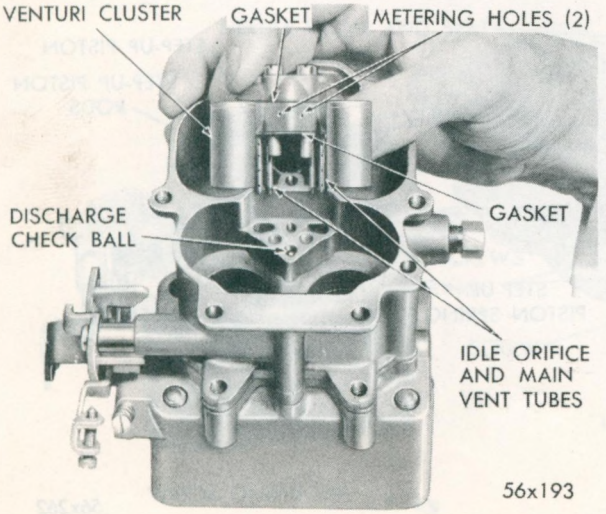

Fig. 9—Removing or Installing Venturi Cluster

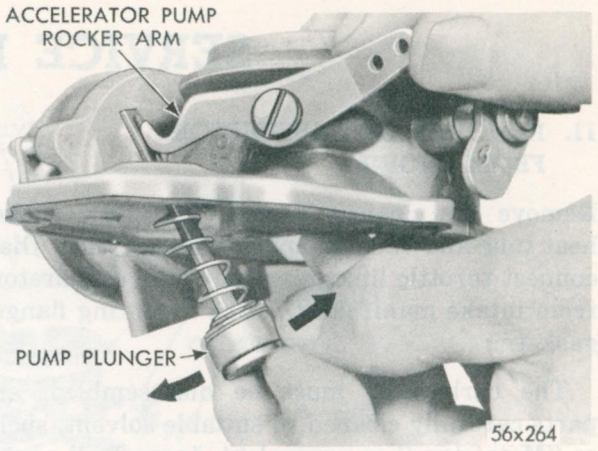

Fig. 10—Removing or Installing Accelerator Pump Plunger

Remove idle mixture adjusting needles and springs from throttle body. Invert carburetor and remove screws that attach throttle to main body. Separate bodies and discard gasket.

Disengage accelerator pump plunger from rocker arm, by pushing up on bottom of plunger and sliding slotted end off rocker arm hook, as shown in Figure 10. If pump plunger leather is worn, hard or cracked, a new pump plunger should be installed at reassembly. Place plunger in a jar of clean gasoline or kerosene to prevent leather from drying out.

Remove screws that attach the thermostatic coil housing and cap to air horn. Remove coil housing, thermostatic coil, cap, gaskets and baffle plate, as shown in Figure 11. Using a file or other suitable tool, remove staking portion of screws that attach choke valve to choke shaft. Remove screws and slide choke valve out

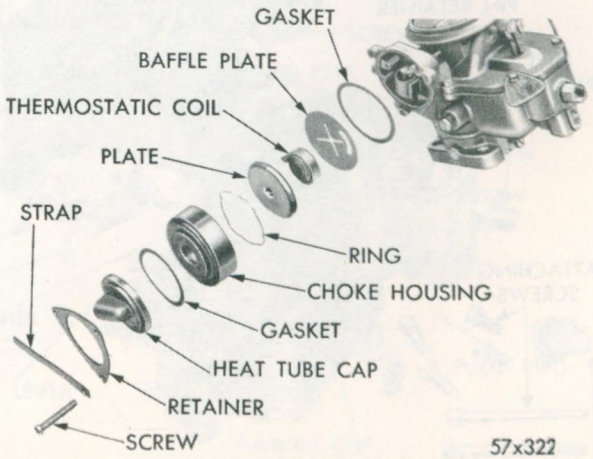

Fig. 11—Removing or Installing Choke Baffle Plate and Gasket

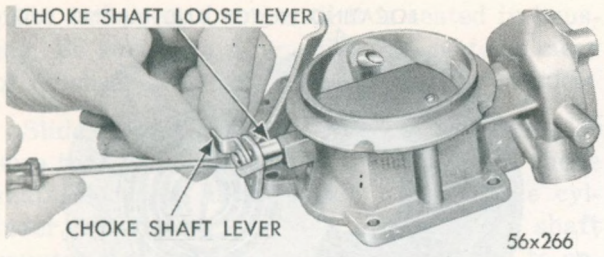

Fig. 12—Removing or Installing the Choke Shaft Lever

of air horn. The choke valve screws are staked to prevent loosening and care must be used at removal so as not to break off in shaft.

Remove screw that attaches choke shaft lever to choke shaft. Hold choke shaft lever firmly with fingers, as shown in Figure 12, so as not to jam choke piston in its well. Slide choke lever, loose lever and washer off end of choke shaft, as shown in Figure 13. Turn choke shaft clockwise until choke piston clears the top of its cylinder, then withdraw the choke piston, link and shaft from air horn, as shown in Figure 14.

The carburetor now has been disassembled into three units, namely, the air horn, main body and throttle body, and component parts of each disassembled as far as necessary for cleaning and inspection. It is usually not advisable to remove throttle shaft or valves, unless wear or damage necessitates installation of new parts. To install new valves or throttle shaft, refer to Inspection and Reassembly Paragraph 14.

13. CLEANING CARBURETOR PARTS

The recommended solvent for gum deposits is denatured alcohol. There are other commercial

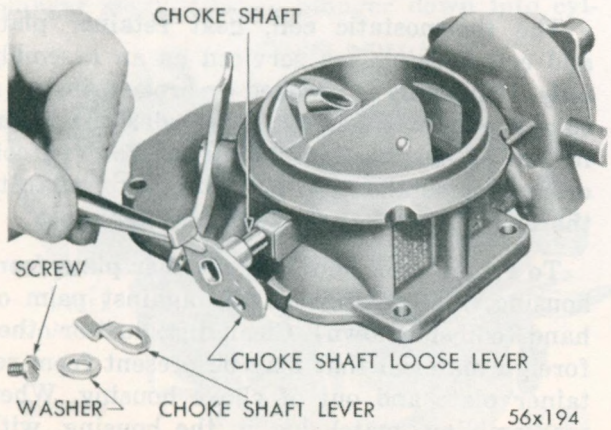

Fig. 13—Removing or Installing Choke Shaft Loose Lever

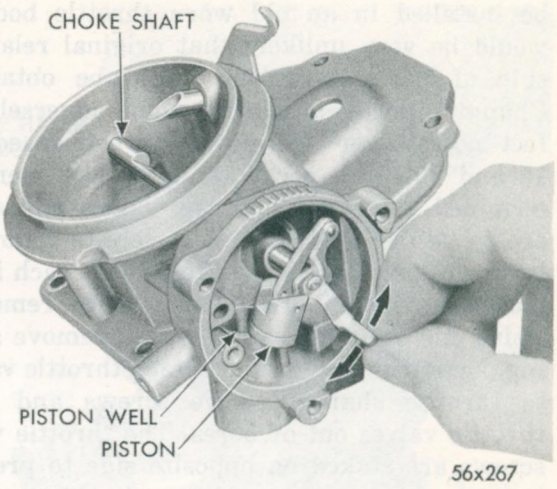

Fig. 14—Removing or Installing Choke Shaft Piston

solvents or cleaners, however, such as Metalclene (or equivalent) which may be used with satisfactory results.

IMPORTANT

If the commercial solvent or cleaner recommends the use of water as a rinse, it should be HOT. After rinsing, all trace of moisture must be blown from passages with air pressure. Never clean jets with wire, drill or other mechanical means as the orifices may become enlarged, making fuel mixture too rich for proper performance.

14. INSPECTION AND REASSEMBLY

Check throttle shaft for excessive wear in throttle body. If wear is extreme, it is recommended that throttle body be replaced rather than installing a new throttle shaft in old body.

During manufacture, location of idle transfer port and spark advance control ports to valves is carefully established for one particular assembly (See Fig. 15). If a new shaft should

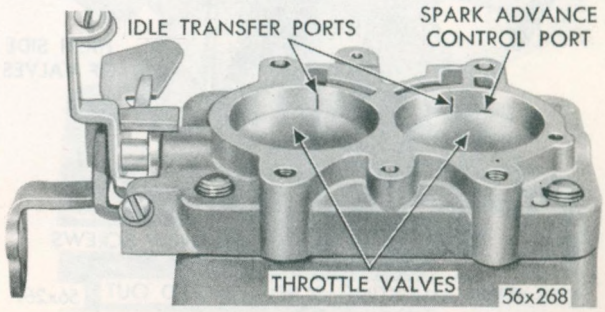

Fig. 15—Ports in Relation to Throttle Valves

be installed in an old worn throttle body it would be very unlikely that original relationship of ports to valves would be obtained. Changing port relationship would adversely affect normal car operation between speeds of 15 and 30 miles per hour. If it has been determined however, that new valves and shaft are to be installed, adhere closely to following instructions: Mark valves to be sure each is replaced in same bore from whence removed. Using file or other suitable tool, remove staking portion of screws that attach throttle valves to throttle shaft. Remove screws and slide throttle valves out of bores. The throttle valve screws are staked on opposite side to prevent loosening and care must be used at removal so as not to break off in shaft.

Slide throttle shaft out of throttle body. Position new shaft in body, then back off idle speed screw (adjusting). This will allow valves to be fully seated for installation operation. The letter "C" in a circle stamped on valves must be toward idle ports and visible from bottom of throttle body when valves are installed. Slide valves into their respective bores, insert NEW attaching screws, but do not tighten. Hold valves in place with fingers, as shown in Figure 16 (fingers pressing on high side of valves).

Tap valves lightly with screwdriver to seat fully in bores. Holding valves in this position, tighten screws securely, then stake by squeezing with pliers. Install two idle mixture adjusting needles and springs in throttle body. (The tapered portion must be straight and

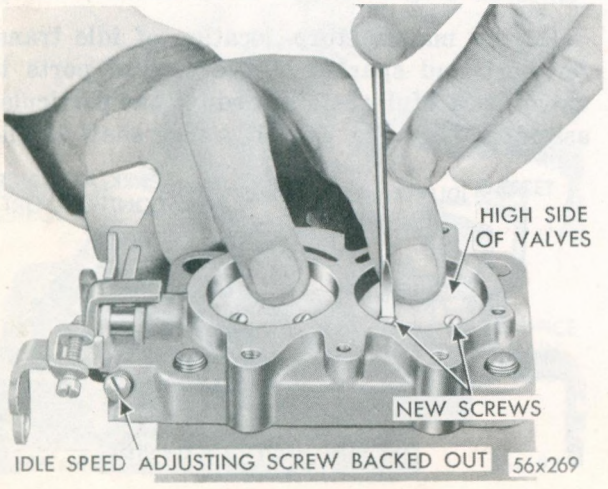

Fig. 16—Removing or Installing Throttle Valves

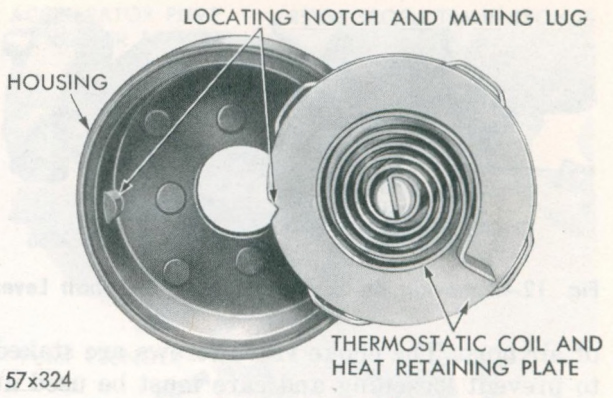

Fig. 17—Installing Heat Retainer Plate

smooth. If tapered portion is grooved or ridged, a new idle mixture adjusting needle should be installed to insure having correct idle mixture control).

a. Idle Mixture Needle Adjustment

The adjustment should be made with fingers. **DO NOT USE A SCREWDRIVER.** Turn needles lightly against their seats, then back off one full turn for approximate setting.

b. Assembling the Automatic Choke

To function properly, it is important that all choke parts be clean and move freely when installed. It is possible, under extremely dust conditions, that fine particles of dirt may be found deposited on various choke parts. A heavy, black, hard carbon deposit on choke parts will indicate the possibility of a leak in the heat tube, in exhaust manifold. Check tube and install a new one if necessary. Examine for wear or damage. Worn or damaged parts must be replaced in order to insure proper choke operation.

The thermostatic coil, heat retainer plate and coil housing are serviced as an assembly **only.** If housing is cracked or broken, install a complete new assembly. The index mark cut in rim of housing is only correct for one coil originally installed. Do not attempt to separate thermostatic coil from heat retainer plate.

To remove coil and heat retainer plate from housing, hit housing sharply against palm of hand (coil side down). Clean dirt, dust or other foreign material that may be present from retainer plate and out of choke housing. When reassembling, match lug in the housing, with notch on plate, as shown in Figure 17. Install

plate and press down until it is seated in housing. Be sure retaining spring in plate is clear of notch.

Slide choke shaft and piston into air horn. Be sure that groove in piston is clean. Turn choke shaft clockwise until piston clears choke cylinder. (Refer to Fig. 14). Turn choke shaft counter-clockwise, allowing choke piston to enter its cylinder. Slide choke valve down into position, then start new screws. Holding valve in closed position, tap gently with screw driver to center and locate valve, then tighten screws securely. Stake by squeezing with pliers. Hold air horn up-right and close choke valve. The valve should open freely of its own weight. Do not lubricate any of choke operating parts.

Install choke baffle plate and gasket. Place coil housing retaining ring over housing and heat tube cap, and, with index mark in down position, install coil housing. Turn the housing clockwise until index mark lines up with one notch rich mark on carburetor, as shown in Figure 18. Install screws and tighten securely. Slide choke shaft loose lever and sleeve over choke shaft, followed by choke shaft lever, washer and screw (Refer to Figure 13. Tighten screw securely. Place new gasket on throttle body. Invert assembly and install attaching screws. Just **snug** screws down, do not tighten at this time.

Place discharge check ball on its seat, test acclerator pump action as follows: Remove accelerator pump plunger from jar of gasoline. Flare back leather several times, slide into pump cylinder. Pour clean gasoline into float chamber (approximately ½ inch deep).

Raise plunger and press lightly on end of plunger shaft, forcing plunger down into cyl-

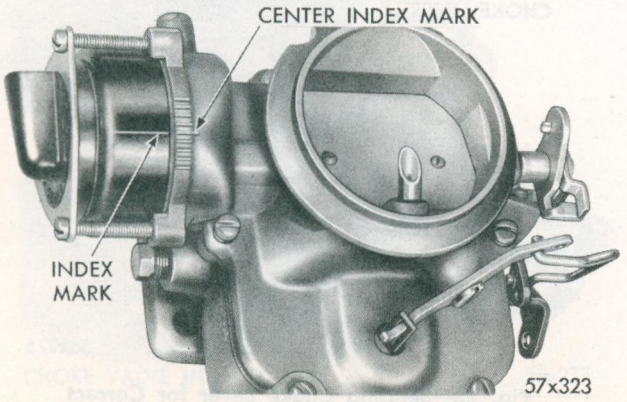

Fig. 18—Alignment of Index Marks of Choke

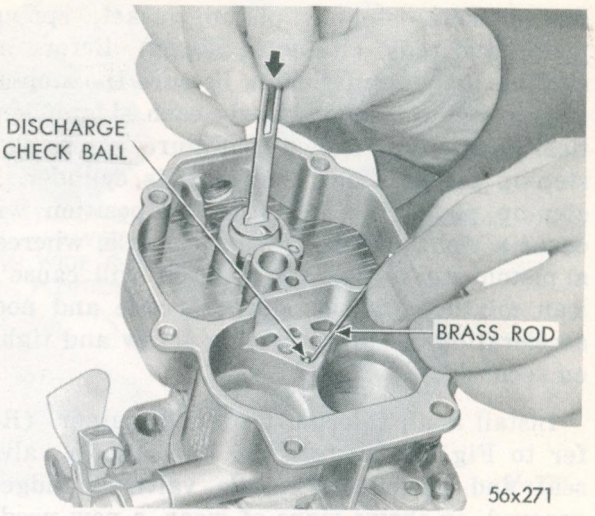

Fig. 19—Accelerator Pump Test

inder. Do this several times, until all air has been removed from discharge passage. Using a small clean brass rod, hold discharge check ball firmly on its seat, as shown in Figure 19.

Raise pump plunger and press downward, no fuel should be emitted from either accelerator pump intake or discharge passage. If fuel does emit from either passage, it is an indication of dirt or a damaged check ball. Remove ball, reclean passage, and, if necessary, install new check ball. Retest as described above.

If fuel still emits from passage, place a small drill rod on check ball. Lightly tap with hammer to form a new ball seat. Install new check ball and test as previously described. If condition still exists, install a new main body. Remove plunger and pour out gasoline after test.

Reinstall the venturi cluster, gaskets and idle bleed screws. Tighten screws securely. (Refer to Fig. 9). Install main metering jets

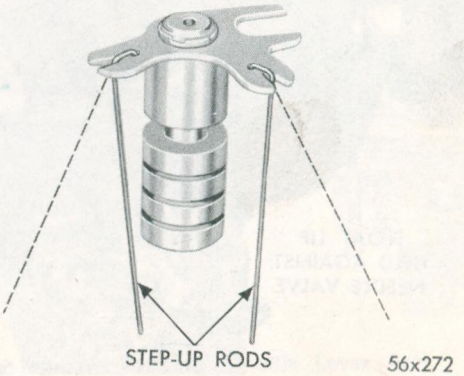

Fig. 20—Positioning Step-Up Rods

and gaskets, step-up piston gasket, spring, piston and rods. (Refer to Fig. 8). Before installing the step-up piston, be sure the step-up rods are able to move freely each side of vertical position, as shown in Figure 20. Be sure step-up piston slides freely in its cylinder. A step-up piston stuck in the **UP** position will cause a rich mixture at part throttle, whereas a piston stuck in **down** position will cause a lean mixture at wide open throttle and poor acceleration. Install retaining screw and tighten securely.

Install float, fulcrum pin and retainer. (Refer to Fig. 6). Install fuel inlet needle valve, seat and gasket. If needle valve is ridged, grooved, or shows signs of wear, a new needle valve and seat should be installed.

c. Checking Float Height

When checking float height, be sure and remove air horn gasket. Place float gauge Tool T-109-282 in position over floats, as shown in Figure 21. Both floats should just touch gauge when float lip is held firmly against inlet needle. To adjust, bend float lip to raise or lower floats until correct setting has been obtained. If one float is lower than the other, equalize by bending float arm.

If Tool T-109-282 is not available, use a steel scale and measure distance from crown of float (in the center) to top of fuel bowl. This measurement should be ¼ inch. Remove accelerator pump plunger from jar of gasoline, slide spring and cup washer over shaft. Slide assembly up through air horn and engage with rocker arm.

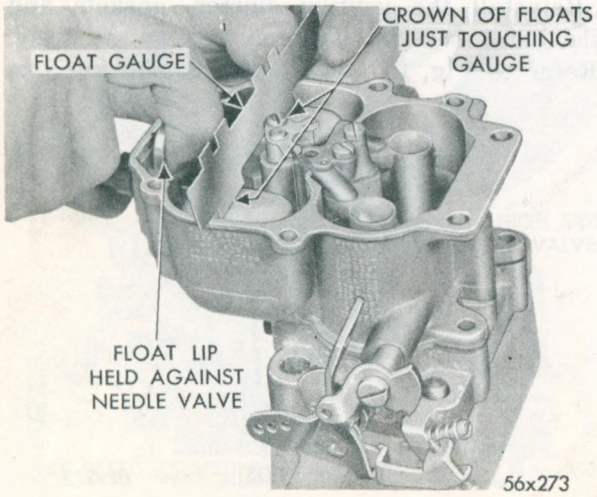

Fig. 21—Checking Float Height

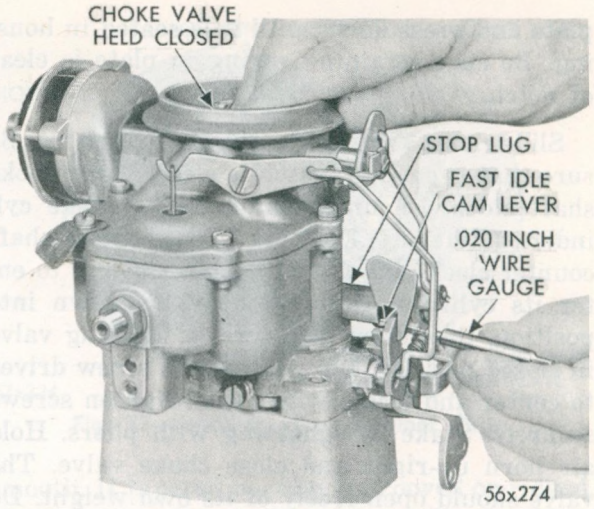

Fig. 22—Checking Fast Idle Cam Adjustment

Using a new gasket, place air horn on main body and install screws. Be sure plunger leather enters pump cylinder evenly.

Install accelerator pump and fast idle rods and secure with hairpin clips. Tighten all air horn and throttle body attaching screws securely.

15. CARBURETOR ADJUSTMENTS

It is very important that following adjustments be made on reconditioned carburetor and in sequence listed, namely; Fast idle cam adjustment, fast idle adjustment, unloader adjustment and accelerator pump adjustment.

a. Fast Idle Cam Adjustment

To make fast idle cam adjustment, hold choke

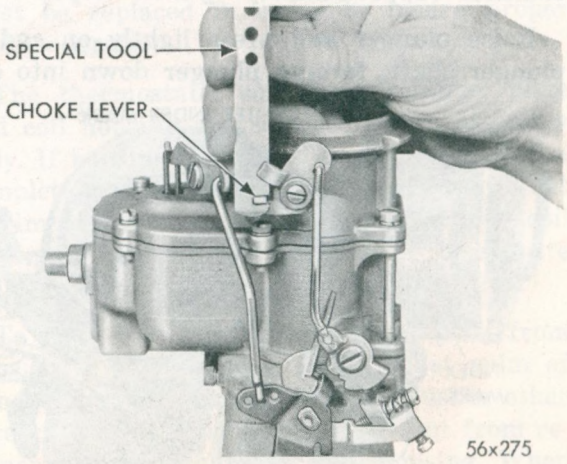

Fig. 23—Bending Choke Lever for Correct Fast Idle Cam Setting

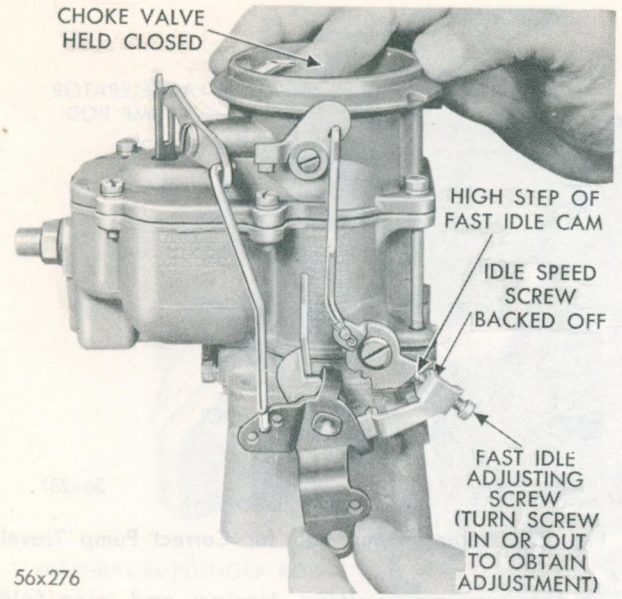

Fig. 24—Checking Fast Idle Setting

valve tightly closed, then, it should be possible to insert a .020 inch wire gauge (Tool T-109-29) between body stop lug and fast idle cam lever, as shown in Figure 22. Adjust if necessary, by bending choke lever, using Tool T-109-22, as shown in Figure 23. Bend lever tang up or down until correct clearance has been obtained.

b. Fast Idle Adjustment

To make fast idle adjustment, back out the idle speed adjustment screw, then close choke valve. In this position, fast idle cam screw should rest on high step of fast idle cam, as shown in Figure 24. Insert wire gauge Tool

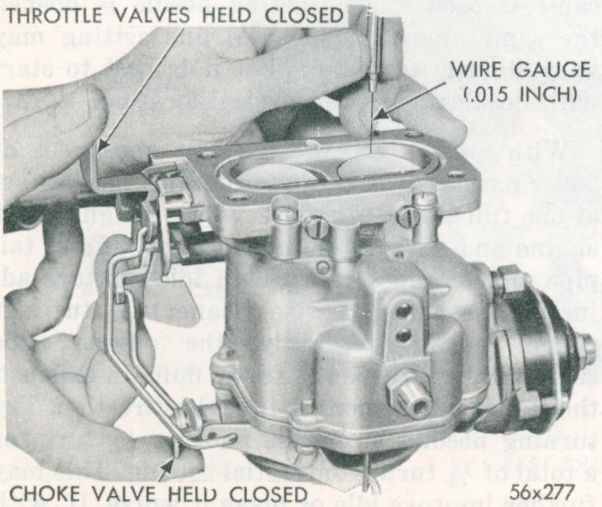

Fig. 25—Correct Throttle Opening for Fast Idle

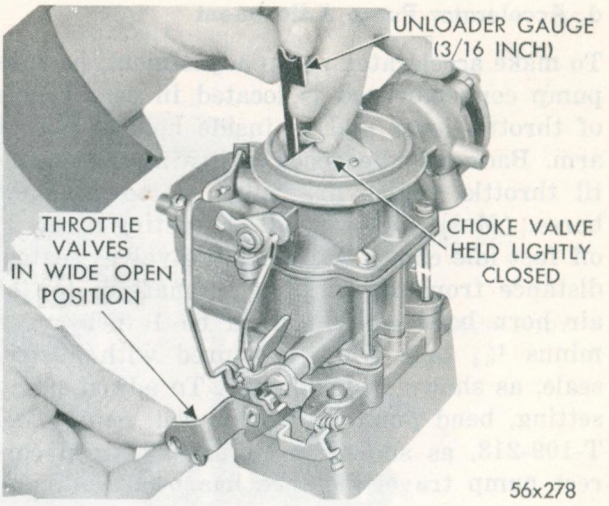

Fig. 26—Checking Choke Unloader Adjustment

T-109-44 (.015 inch) between throttle valve and side of bore opposite ports, as shown in Figure 25. Adjust fast idle screw to give a slight drag on gauge as it is being withdrawn.

c. Choke Unloader Adjustment

To make unloader adjustment, lightly hold choke valve closed, then open throttle valves to wide open position. The choke valve should open sufficiently to allow unloader gauge Tool T-109-28 ($\frac{3}{16}$ inch) to be inserted between choke valve and wall of air horn, as shown in Figure 26. Adjust if necessary, by bending the arm on throttle lever, using Tool T-109-213, as shown in Figure 27, until correct clearance has been obtained.

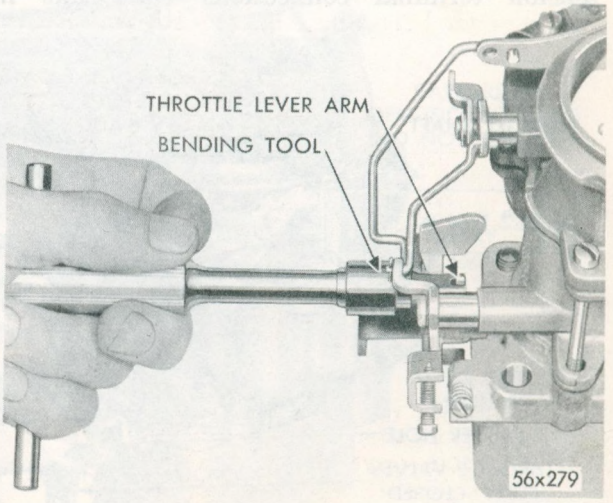

Fig. 27—Bending Throttle Lever Arm for Unloader Adjustment

d. Accelerator Pump Adjustment

To make accelerator pump adjustment, be sure pump connector rod is located in center hole of throttle lever and in inside hole of rocker arm. Back off idle speed adjusting screw until throttle valves are fully seated in their bores. (Make sure fast idle adjusting screw is off fast idle cam.) With throttle valves seated, distance from top of plunger shaft to top of air horn bowl cover, should be 1 inch ± or minus 1/64 inch when measured with a steel scale, as shown in Figure 28. To adjust pump setting, bend pump connector rod, using Tool T-109-213, as shown in Figure 29, until correct pump travel distance has been obtained.

16. INSTALLATION OF CARBURETOR ON ENGINE

Install a new carburetor mounting gasket on intake manifold, then install carburetor. Before tightening attaching nuts, start fuel and vacuum lines, to prevent stripping threads on these connections. Complete tightening of attaching nuts, fuel and vacuum line connections, install heat control tube. Install throttle control linkage return spring and anchor, the air cleaner and gasket. Set engine idle speed as follows.

Idle Mixture Adjustment—No amount of carburetor adjustment will give a smooth engine idle, unless following items are known to be in good condition and/or adjusted correctly. Spark plugs, distributor points, good high tension terminal connections (no leaks in

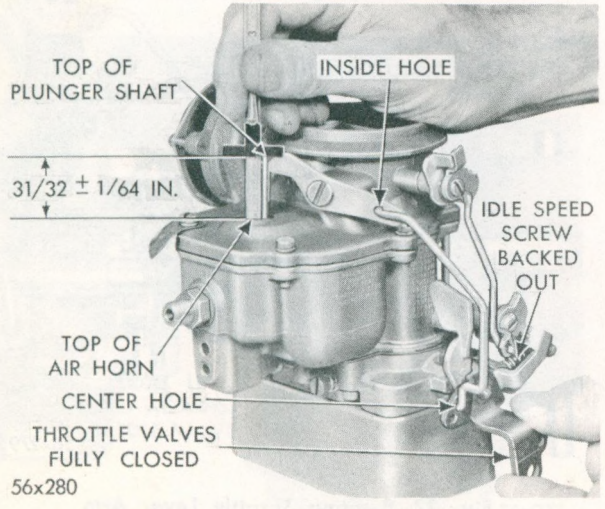

Fig. 28—Checking Accelerator Pump Travel

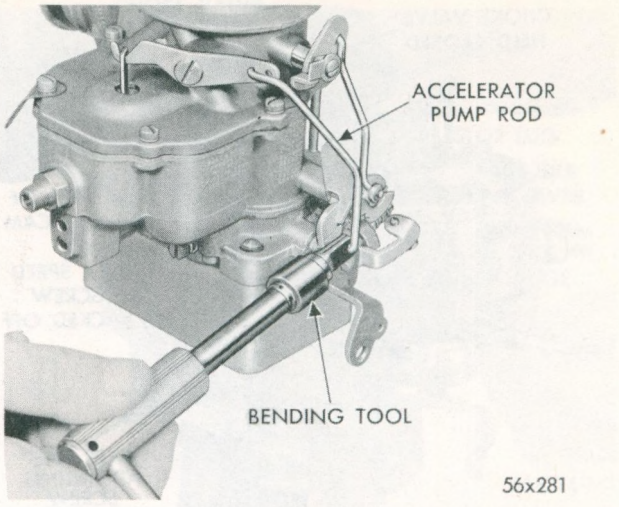

Fig. 29—Bending Pump Rod for Correct Pump Travel

leads), engine ignition timing and manifold heat control valve operating properly.

If it was not made during assembly of carburetor, make preliminary setting of idle mixture adjusting needles, by turning them clockwise until seated. Back out one full turn. To prevent damage to the needles and seats, use finger pressure **ONLY** to make this adjustment.

Try and turn each adjusting needle the same amount. There is very little inter-connection between two branches of intake manifold. The cylinders on each branch will react to changes in idle mixture as much as if there were two four cylinder engines. It is assumed that approximately the same idle mixture is required by each set of four cylinders. It is further assumed that idle mixture delivered by each barrel of carburetor will be approximately the same if each idle adjusting needle is opened the same amount. The final fine setting may vary slightly from this, but it is best to start with needles in same physical location.

With engine warmed-up, idle speed set at 500 r.p.m. and both idle adjusting needles set at one full turn open, observe the roughness of engine and absence or presence of fluffs at tail pipe and/or pipes. Turn both idle mixture adjusting needles clockwise (leaner) 1/8 turn. If r.p.m. increases slightly, the engine runs smoother, and there are fewer fluffs in exhaust, the leaner adjustment is in right direction. Try turning needles clockwise another 1/8 turn, or a total of 1/4 turn from initial setting. This may further improve idle or make it worse. If, with this setting, the idle was improved, reset idle

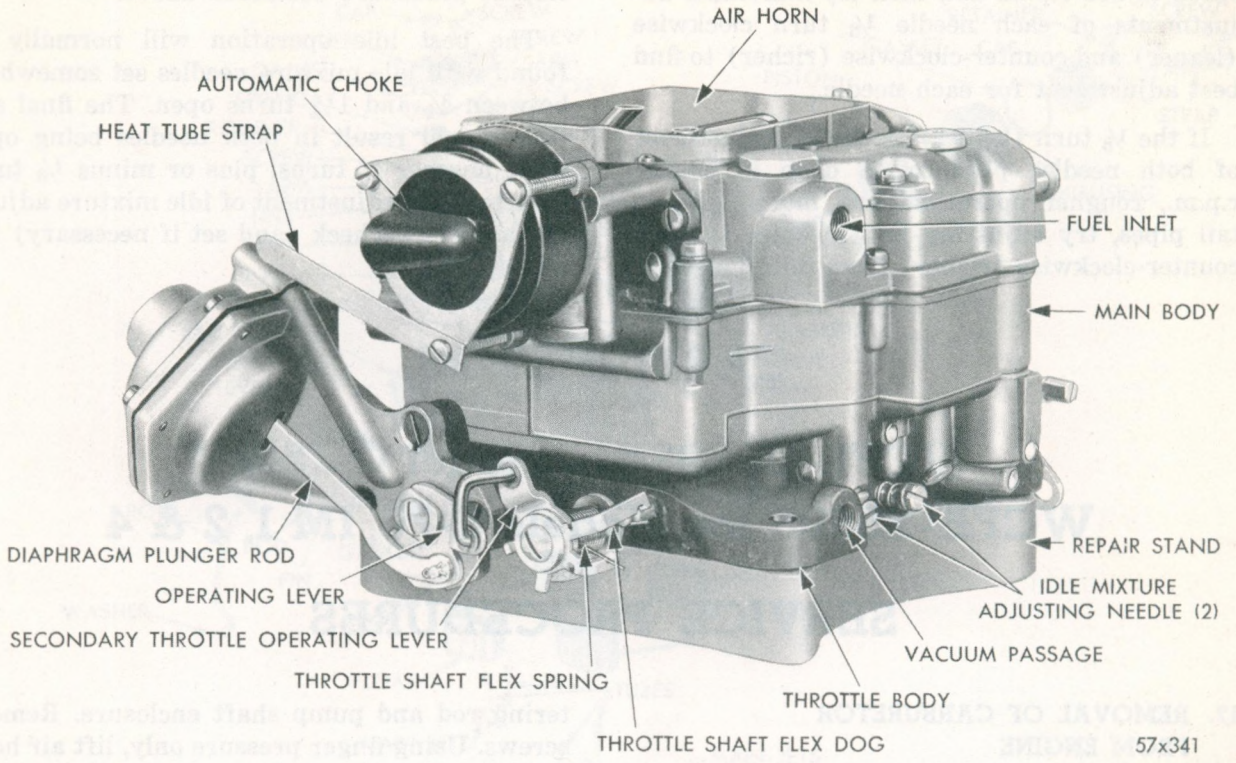

Fig. 30—Carburetor Assembly (WCFB 2589S or 2590S)

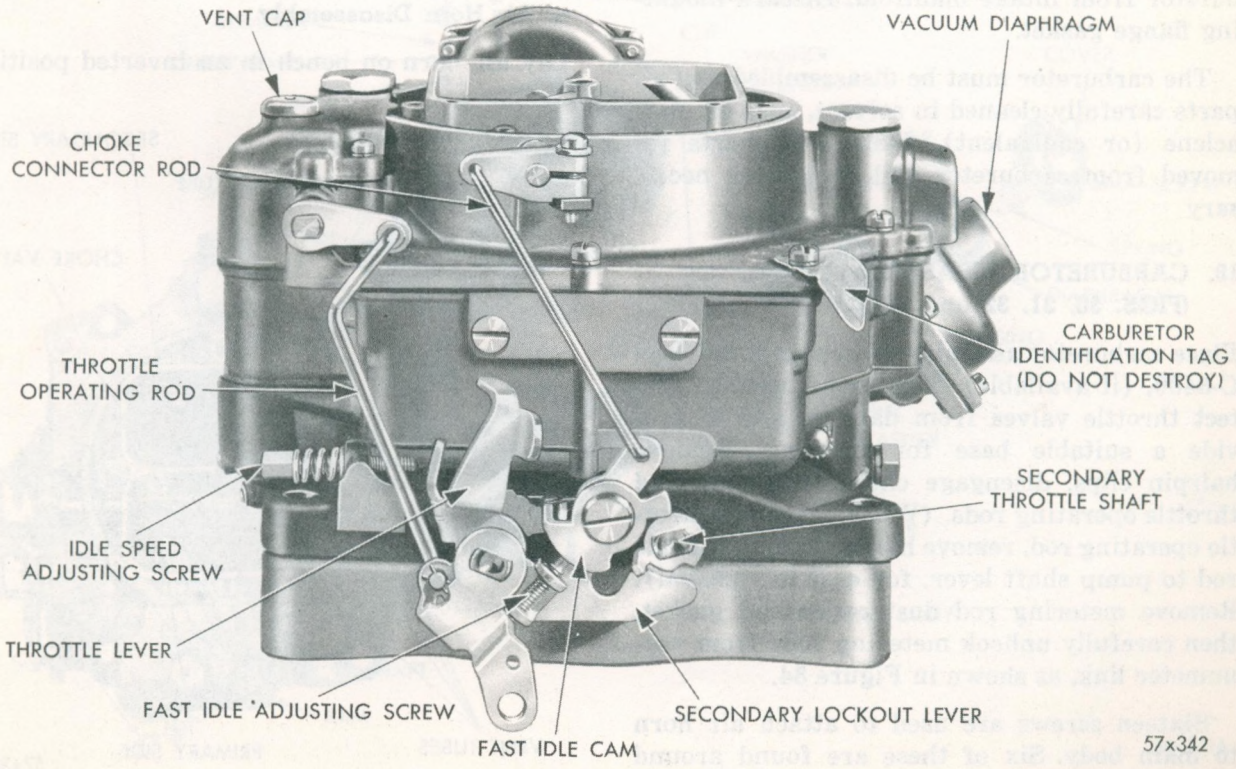

Fig. 31—Carburetor Assembly (WCFB 2589S or 2590S)

speed to 500 r.p.m. and then try individual adjustments of each needle 1/8 turn clockwise (leaner) and counter-clockwise (richer) to find best adjustment for each needle.

If the 1/8 turn (leaner) clockwise adjustment of both needles produced a drop in engine r.p.m., rougher operation, and more fluffs at tail pipes, try adjusting both needles 1/8 turn counter-clockwise (richer) from initial setting. Repeat procedure described above.

The best idle operation will normally be found with idle mixture needles set somewhere between 3/4 and 1 1/4 turns open. The final setting should result in both needles being open same number of turns, plus or minus 1/8 turn.

After final adjustment of idle mixture adjusting needles, recheck (and set if necessary) the idle speed.

CARBURETORS

WCFB-2589S for Model C-75-2
WCFB-2590S for Models C-76, IM 1, 2 & 4

SERVICE PROCEDURES

17. REMOVAL OF CARBURETOR FROM ENGINE

Remove air cleaner and gasket. Disconnect fuel line, choke heat tube and vacuum spark advance tube. Disconnect throttle linkage, remove carburetor from intake manifold. Discard mounting flange gasket.

The carburetor must be disassembled and all parts carefully cleaned in solvent, such as Metaclene (or equivalent). Inspect all parts removed from carburetor and replace as necessary

18. CARBURETOR DISASSEMBLY (FIGS. 30, 31, 32 and 33).

Place carburetor assembly on repair stand Tool C-3400, (if available). This tool is used to protect throttle valves from damage and to provide a suitable base for working. Remove hairpin clips, disengage choke connector and throttle operating rods. (When removing throttle operating rod, remove hairpin clip that holds rod to pump shaft lever, for ease in removal). Remove metering rod dust cover and gasket, then carefully unhook metering rods from vacuumeter link, as shown in Figure 34.

Sixteen screws are used to attach air horn to main body. Six of these are found around inside of air cleaner enclosure, (Fig. 32) nine around flange of air horn and one within metering rod and pump shaft enclosure. Remove screws. Using finger pressure only, lift air horn straight up and away from main body. This will prevent damage to floats, accelerator pump plunger or vacuumeter piston.

a. Air Horn Disassembly

Lay air horn on bench in an inverted position.

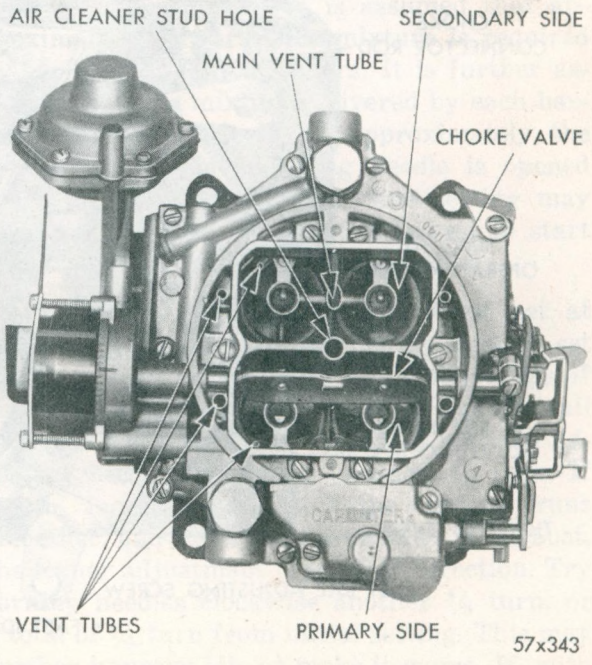

Fig. 32—Carburetor Assembly (Inside View)

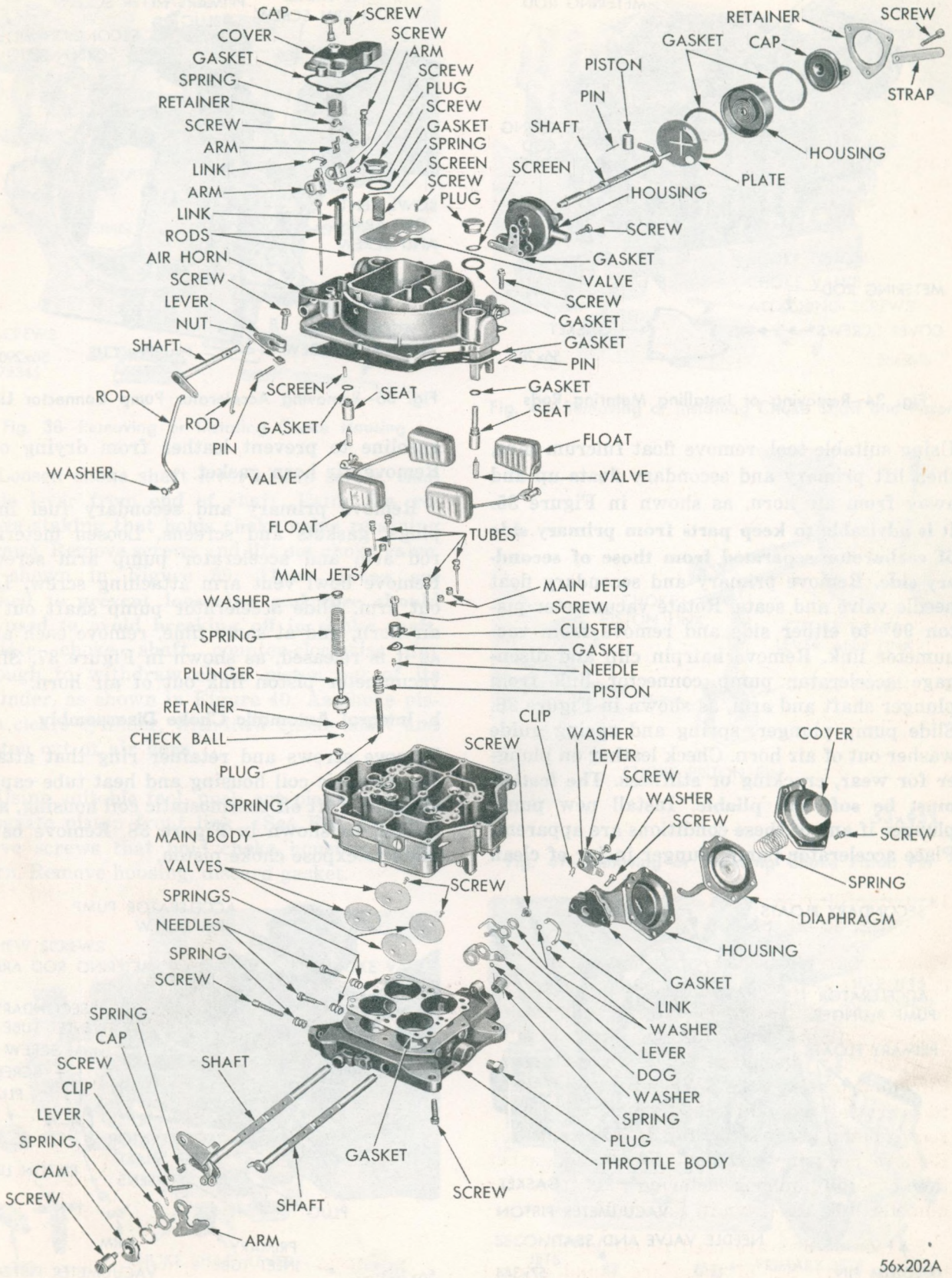

Fig. 33—Carburetor (WCFB 2589S or 2590S) (Disassembled View)

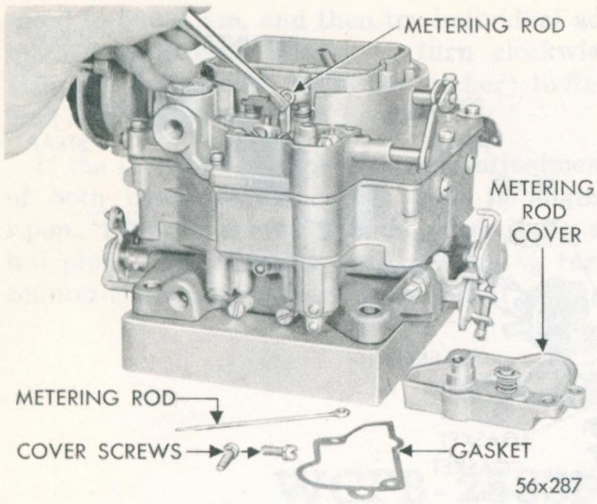

Fig. 34—Removing or Installing Metering Rods

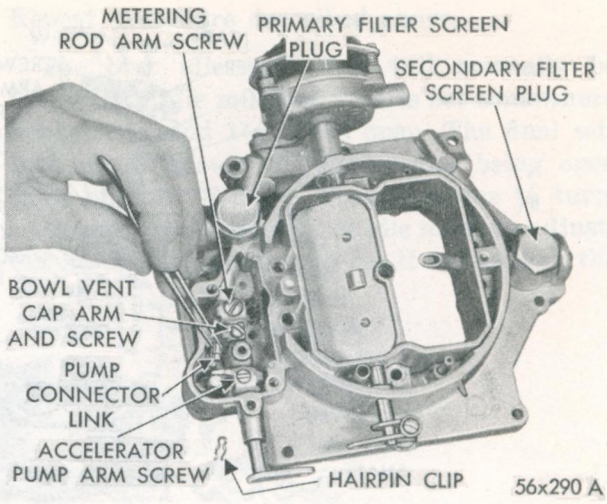

Fig. 36—Removing Accelerator Pump Connector Link

Using suitable tool, remove float fulcrum pins, then lift primary and secondary floats up and away from air horn, as shown in Figure 35. **It is advisable to keep parts from primary side of carburetor separated from those of secondary side.** Remove primary and secondary float needle valve and seats. Rotate vacuumeter piston 90° to either side and remove from vacuumeter link. Remove hairpin clip and disengage accelerator pump connector link from plunger shaft and arm, as shown in Figure 36. Slide pump plunger, spring and spring guide washer out of air horn. Check leather on plunger for wear, cracking or stiffness. **The leather must be soft and pliable.** Install new pump plunger if any of these conditions are apparent. Place accelerator pump plunger in jar of clean gasoline to prevent leather from drying out. Remove air horn gasket.

Remove primary and secondary fuel inlet plugs, gaskets and screens. Loosen metering rod arm and accelerator pump arm screws. Remove bowl vent arm attaching screw. Lift out arm. Slide accelerator pump shaft out of air horn, and at same time, remove each arm as it is released, as shown in Figure 37. Slide vacuumeter piston link out of air horn.

b. Integral Automatic Choke Disassembly

Remove screws and retainer ring that attach thermostatic coil housing and heat tube cap to air horn. Lift off thermostatic coil housing, and gasket, as shown in Figure 38. Remove baffle plate to expose choke piston.

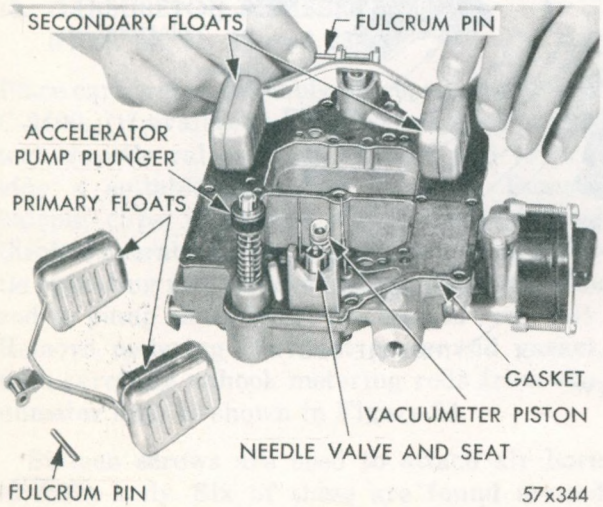

Fig. 35—Removing or Installing Floats

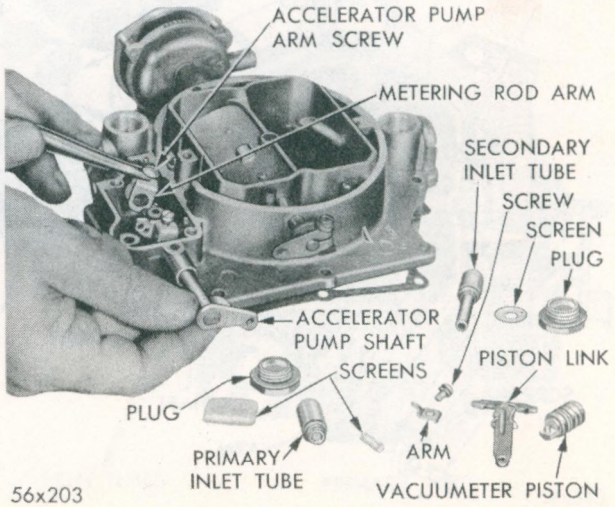

Fig. 37—Removing or Installing Accelerator Pump Shaft

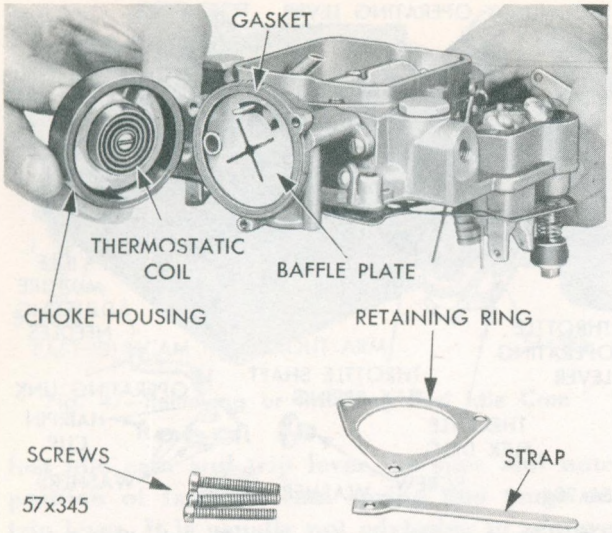

Fig. 38—Removing or Installng Choke Housing

Loosen choke shaft lever clamp screw, then slide lever from end of shaft. Using file, remove staking that holds choke valve retaining screws. Remove screws and lift out choke valve, as shown in Figure 39. **These screws are staked to prevent loosening and care should be used to avoid breaking off in choke shaft.** Rotate choke shaft counter-clockwise far enough to withdraw choke piston out of its cylinder, as shown in Figure 40. As choke piston clears cylinder, withdraw choke shaft and piston out of air horn.

Using suitable tool, push out piston pin and separate piston front link. (See Fig. 41). Remove screws that hold choke housing to air horn. Remove housing, discard gasket.

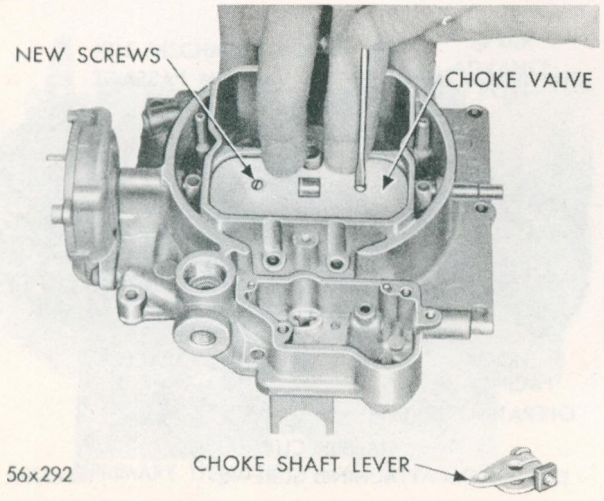

Fig. 39—Removing or Installing Choke Valve

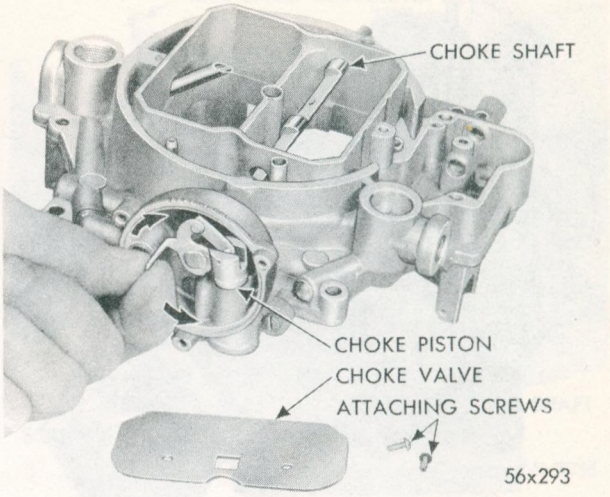

Fig. 40—Removing or Installing Choke Shaft and Piston

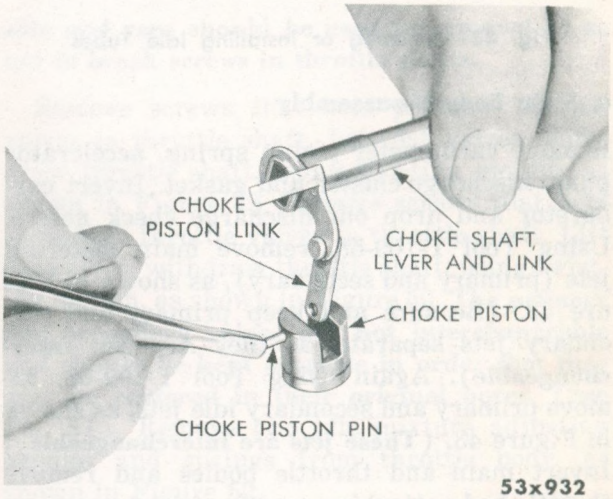

Fig. 41—Removing or Installing Choke Piston Pin

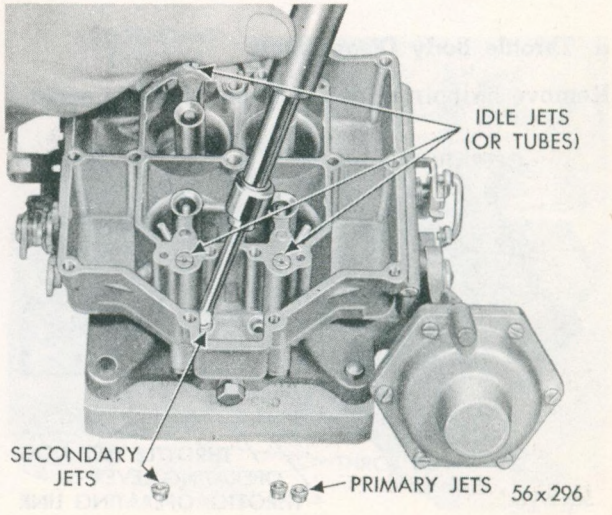

Fig. 42—Removing or Installing Main Metering Jets

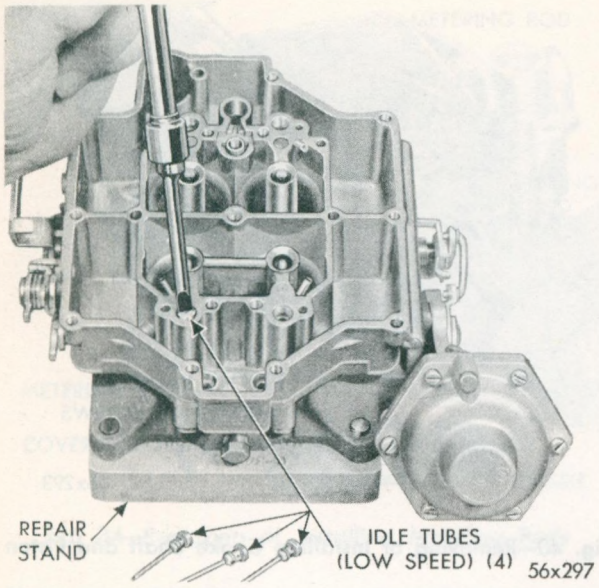

Fig. 43—Removing or Installing Idle Tubes

c. Main Body Disassembly

Remove vacuumeter piston spring, accelerator pump discharge cluster and gasket. Invert carburetor and drop out discharge check needle. Using Tool T-109-58, remove main metering jets (primary and secondary), as shown in Figure 42. (Be sure and keep primary and secondary jets separate, as they **Are Not Interchangeable**). Again using Tool T-109-58, remove primary and secondary idle jets, as shown in Figure 43. (**These jets are interchangeable**). Invert main and throttle bodies and remove throttle body attaching screws, (short screw on primary side-center). Remove throttle body, discard gasket.

d. Throttle Body Disassembly

Remove hairpin clips that hold throttle operating link to primary and secondary operating levers. Slide link out and away from levers, as shown in Figure 44. (Don't lose washers). Disengage throttle flex spring from tang on throttle flex dog, and slide flex dog off primary shaft, as shown in Figure 45. Remove operating lever and flex spring.

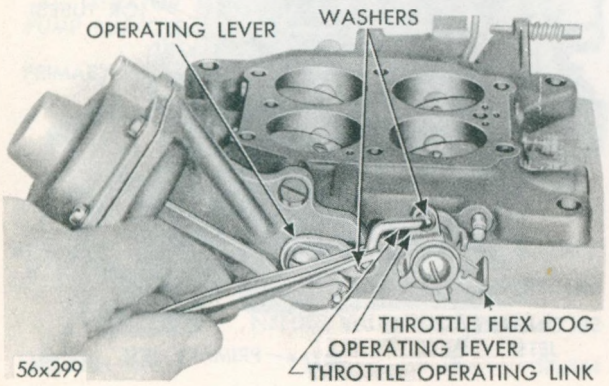

Fig. 44—Removing or Installing Throttle Operating Link

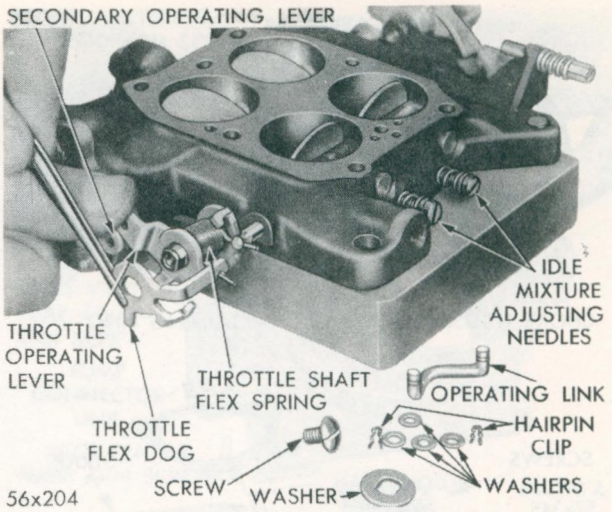

Fig. 45—Removing or Installing Throttle Flex Dog

Disconnect vacuum diaphragm plunger from secondary operating lever by removing hairpin clip. Remove operating lever retaining screw and washer, slide lever off secondary throttle shaft. Remove screws that attach vacuum diaphragm to throttle body. Remove vacuum diaphragm, as shown in Figure 46, discard gasket.

Loosen screw that attaches fast idle cam assembly to throttle body boss, lift off fast idle cam assembly, cam trip lever, locknut arm and screws, as shown in Figure 47. **When removing**

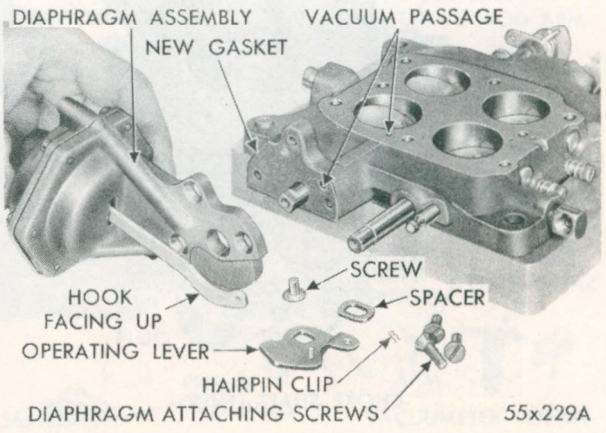

Fig. 46—Removing or Installing Vacuum Diaphragm

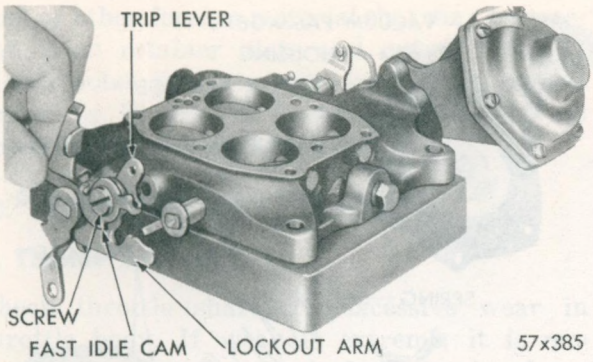

Fig. 47—Removing or Installing Fast Idle Cam

fast idle cam and trip lever, be sure and note position of fast idle cam spring and tangs on trip lever. It is usually not advisable to remove throttle shafts or valves, unless wear or damage necessitates installation of new parts.

During manufacture, location of idle transfer port and spark advance control port to valves is carefully established for one particular assembly, (see Fig. 48). If new shaft should be installed in an old worn throttle body, it would be very unlikely that original relationship of these ports to valves would be obtained. Changing port relationship would adversely affect normal carburetor operation between speeds of 15 and 30 miles per hour. If it has been determined, however, that new shafts are to be installed, adhere closely to following instructions:

It is suggested that throttle valves be marked in order that each may be returned to same bore from which it was removed. The screws that attach the throttle valves are staked on opposite

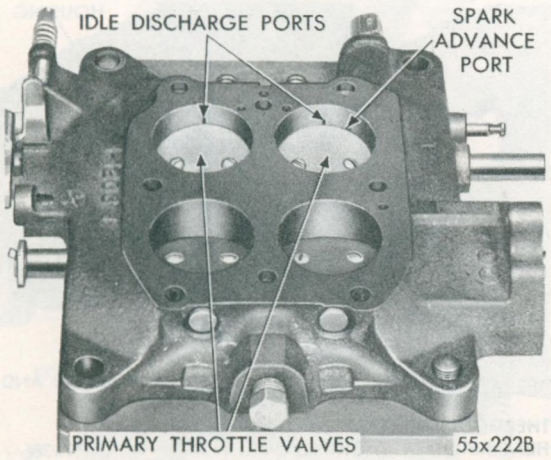

Fig. 48—Parts in Relation to Primary Throttle Valves

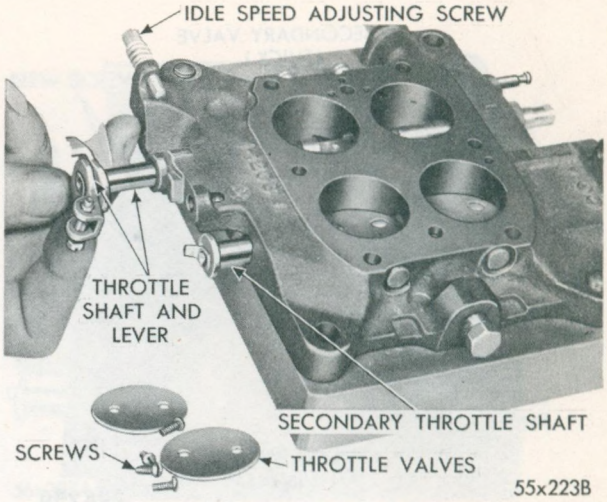

Fig. 49—Removing or Installing Primary Throttle Shaft Lever

side and care should be used in removal so as not to break screws in throttle shafts.

Remove screws that hold primary throttle valves to throttle shaft. Lift out valves, withdraw throttle shaft, using twisting motion, as shown in Figure 49. Remove screws that hold secondary throttle valves to throttle shaft. Lift out valves, withdraw throttle shaft, using twisting motion, as shown in Figure 50. **The primary and secondary valves are not interchangeable and should be kept separate in order that they may be replaced in their original bores. (See Fig. 51).** Remove two idle mixture adjusting needles and springs from throttle body, as shown in Figure 52.

The carburetor now has been disassembled into four units, namely, air horn, main body,

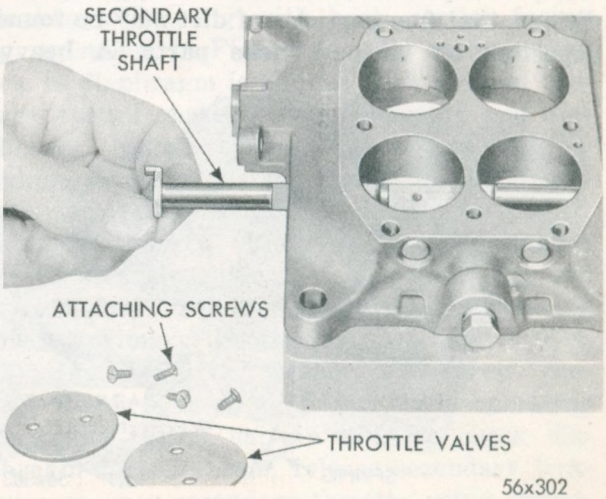

Fig. 50—Removing or Installing Secondary Throttle Shaft

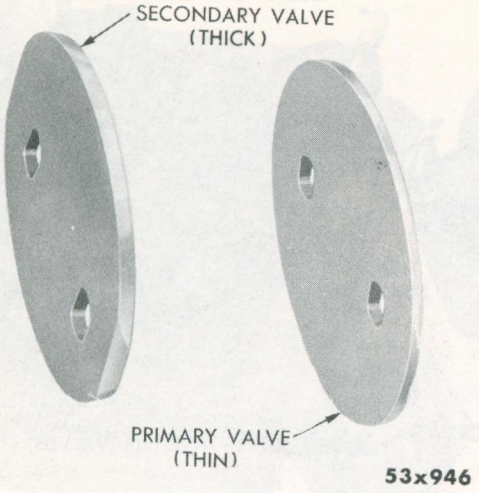

Fig. 51—Throttle Valve Identification

throttle body and automatic choke and component parts disassembled as far as necessary for cleaning and inspection.

e. Vacuum Diaphragm Disassembly

Remove screws that attach diaphragm housing cover to housing. Separate cover and housing, and lift out diaphragm gasket, plunger and spring, as shown in Figure 53. Check diaphragm for wear, rupture or tearing. If necessary, install new diaphragm gasket and plunger assembly.

19. CLEANING CARBURETOR PARTS

Refer to Paragraph 13 for Cleaning Instructions. For automatic choke to function properly, it is important that all parts be clean and move freely. It is possible, under extremely dusty conditions, that fine particles of dirt may be found deposited on various choke parts. A heavy,

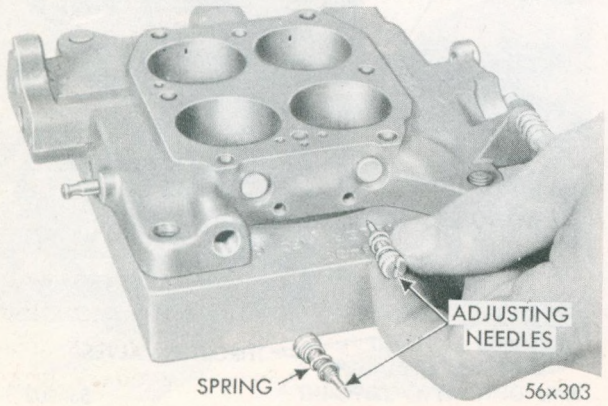

Fig. 52—Removing or Installing Idle Mixture Adjusting

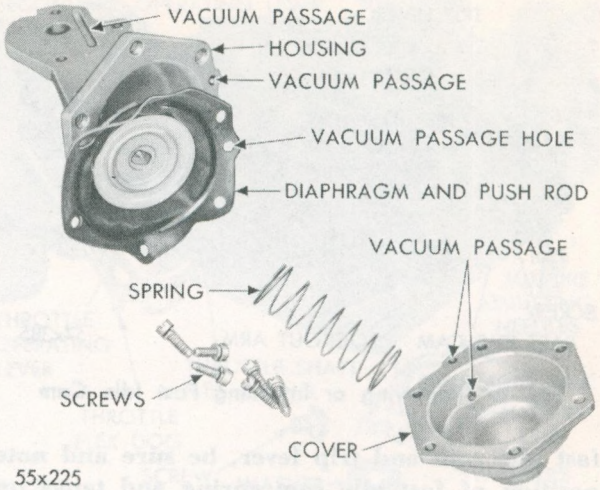

Fig. 53—Vacuum Diaphragm Assembly (Disassembled View)

black, hard carbon deposit on choke parts indicates possibility of leak in heat tube. Check tube in exhaust manifold and repair as required.

Examine all choke parts for wear or damage. Worn or damaged parts must be replaced with new, to insure proper operation of choke. **Do not attempt to separate thermostatic coil from heat retainer plate.** The thermostatic coil heat retainer plate and moulded bakelite housing are serviced as an assembly only. If housing is cracked or broken, replace with a completely new assembly, as index mark cut on rim of housing is only correct for one thermostatic coil originally installed.

To remove thermostatic coil and heat retainer plate from housing, hit housing sharply against palm of hand (coil side down). Clean any dirt,

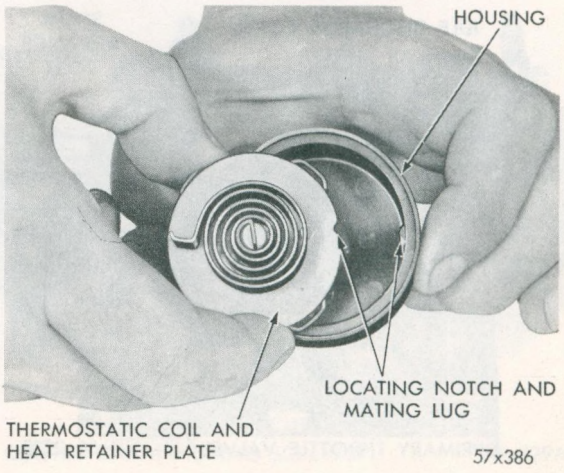

Fig. 54—Installing Coil in Housing

dust or other foreign material that may be present, from retainer plate and out of housing. Match notch in plate with lug in housing, as shown in Figure 54. Install plate and press down until seated in housing.

20. INSPECTION AND REASSEMBLY

a. Throttle Body

Check throttle shaft for excessive wear in throttle body. If wear is extreme, it is recommended that throttle body be replaced rather than installing a new throttle shaft in old body. Slide secondary throttle shaft and lever into throttle body with tang on lever pointing toward fast idle cam boss. (Refer to Fig. 50). Slide secondary valves into position, install new screws; do not tighten. Hold valves in place with fingers, as shown in Figure 55. (Fingers pressing on high side of valves). Now tap valves lightly with screwdriver to seat in bores. Holding valves in this position, tighten screws securely and stake by squeezing with pliers.

Slide primary throttle shaft and lever in throttle body. (Refer to Fig. 49). Slide primary valves into position, install new screws; do not tighten. Hold valves in place with fingers, as shown in Figure 56. (Fingers pressing on high side of valves). Tap the valves lightly with screwdriver to seat in throttle bores. Holding the valves in this position, tighten screws securely and stake by squeezing with pliers.

Install two idle mixture adjusting screws and springs in throttle body. (Refer to Fig. 52). The tapered portion must be straight and smooth.

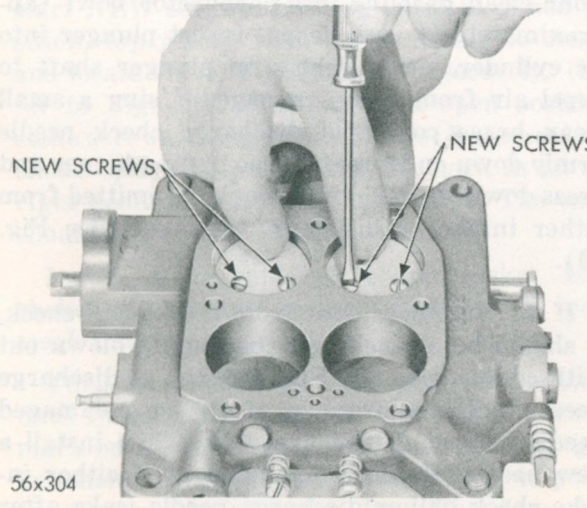

Fig. 55—Installing Secondary Throttle Valves

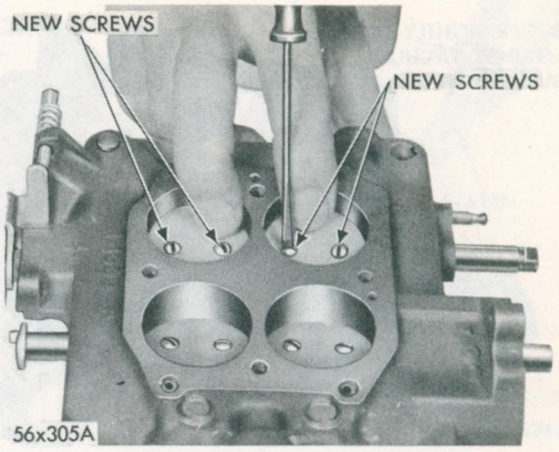

Fig. 56—Installing Primary Throttle Valves

If tapered portion is grooved or ridged a new idle mixture adjusting screw should be installed to insure having correct idle mixture control. **DO NOT USE A SCREWDRIVER.** The adjustment should be made with the fingers. Turn needles lightly against their seats, then back off one full turn for approximate adjustment.

Slide fast idle cam retaining screw through fast idle cam (the threaded shank of screw on spring side). Slide fast idle cam trip lever over shoulder on screw, guiding tang between fast idle spring and cam. Slide lockout arm over screw, with lockout detent pointing toward secondary throttle shaft lever tang. Insert pivot screw in position in throttle body and tighten securely. Be sure all parts move freely. (See Fig. 47).

Slide diaphragm plunger rod through slot in diaphragm housing with hook portion facing up, as shown in Figure 46. (Be sure vacuum hole in diaphragm is aligned with vacuum passage. Install gasket between housing and diaphragm. Install spring, cover and screws, tighten securely. Install vacuum unit over secondary throttle shaft and against throttle body, using new gasket. (Refer to Fig. 46). Tighten screws securely. Slide operating lever over end of secondary throttle shaft with arm pointing toward primary throttle shaft. (Refer to Fig. 45). Install spacer, washer, and screw, connect diaphragm plunger rod with operating lever and install hairpin clip. To check diaphragm for operation, release secondary lockout arm, open secondary throttle, using operating lever. Place finger over vacuum passage hole

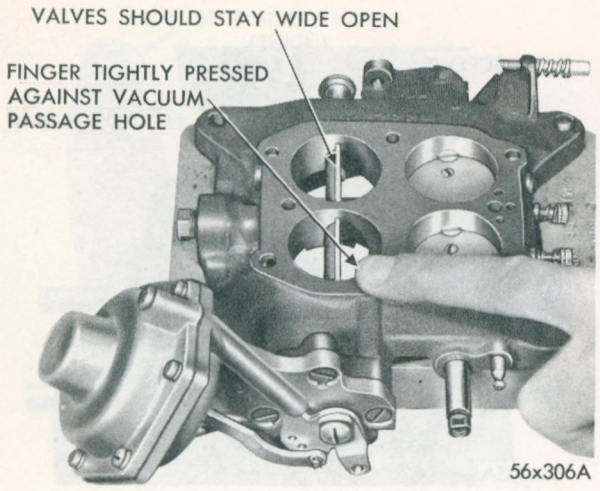

Fig. 57—Checking Vacuum of Diaphragm

in throttle body, as shown in Figure 57. Release operating lever. The throttle valves should hold wide open position, or close very, very slowly. If throttle valves snap shut, it is an indication of a leak in diaphragm or housing mounting gasket. Correct as necessary.

Slide flex spring into position in throttle operating lever and slide over end of primary shaft. Slide throttle flex dog over shaft and down against operating lever. Install washer and screw; tighten securely. (Be sure notched tangs are pointing toward throttle body. (See Fig. 45). Engage flex spring ends with notches on each lever, install throttle operating link washers and hairpin clips. (Refer to Fig. 44). Place main body upside down on bench, install new throttle to main body gasket. Lower throttle body down on main body. Install screws and tighten securely. **The accelerator pump well should be on same side as idle mixture adjusting needles. Remember, short attaching screw should be installed on primary side.** Invert carburetor and mount in repair stand, assemble main body as follows:

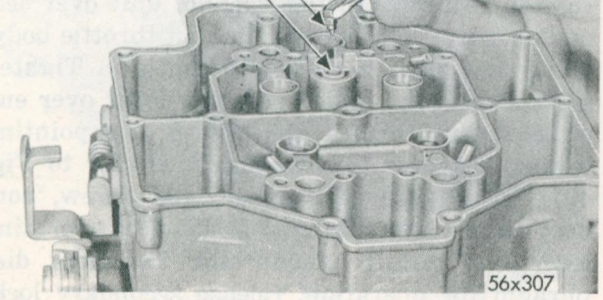

Fig. 58—Installing Accelerator Pump Discharge Check Needle

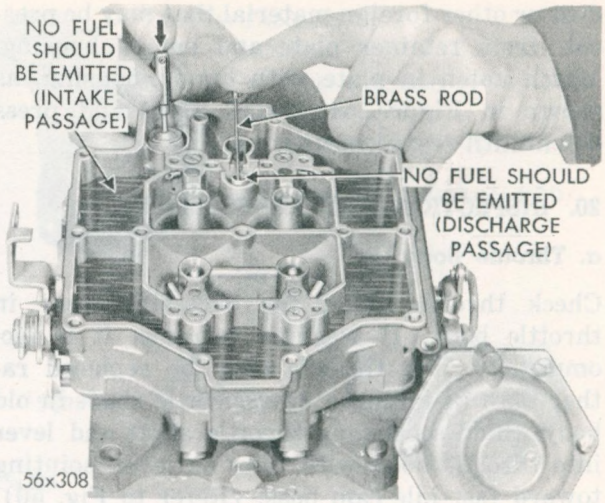

Fig. 59—Accelerator Pump Test

b. Main Body Assembly

Install accelerator pump discharge check needle in discharge passage, as shown in Figure 58. Install primary and secondary idle jets (Refer to Fig. 43). Tighten securely, using Tool T-109-58. Remove accelerator pump plunger from jar of gasoline and flex leather several times. Check to see if leather is hard, cracked or worn. If any aforementioned conditions exists, install a new accelerator pump plunger. Test operation of accelerator pump as follows:

c. Accelerator Pump Test

Pour clean gasoline into carburetor bowl (approximately ½ inch deep). Insert plunger into its cylinder, press lightly on plunger shaft to expel air from pump passages. Using a small clean brass rod, hold discharge check needle firmly down on its seat. Raise pump plunger and press downward. No fuel should be emitted from either intake or discharge passage. (See Fig. 59).

If any fuel does emit from intake ball check, it should be cleaned and thoroughly blown out with compressed air. Fuel leakage at discharge needle indicates presence of dirt or a damaged needle or seat. Clean again and then install a new needle. Recheck for leakage. If either intake check ball or discharge needle leaks after above test, attempt to reseat as follows:

d. Intake Check Ball

Remove check ball retainer from bottom of accelerator pump cylinder. Insert a piece of drill rod down on check ball. Lightly tap with a hammer to form new seat. Install new check ball and retainer, retest as described previously.

e. Discharge Check Needle

Insert small piece of drill rod down on needle. Lightly tap drill rod with hammer to form new seat. Discard old needle and install new one. Retest as described previously. If above instructions do not correct condition, a new carburetor main body assembly must be installed.

Install accelerator pump discharge cluster, gasket and screw. (Refer to Fig. 41). Tighten screw securely. Depress accelerator pump plunger. A clear straight stream should emit from each jet. If streams are not identical, (if either one is diverted or restricted) a new accelerator pump discharge cluster should be installed. After test, pour gasoline from carburetor bowl and remove accelerator pump plunger.

f. Air Horn Assembly

Place new gasket over sleeve on rear of choke housing, install housing in position on air horn. Tighten screws securely. Slide choke piston pin through piston and choke piston link (see Fig. 41); slide assembly into air horn. Slide choke shaft into air horn far enough to allow choke piston to be aligned with center of cylinder, turn shaft slightly clockwise and allow piston to enter its cylinder, (See Fig. 40). Slide choke valve down into position (numbered side up) and start NEW screws. Holding valve in closed position, tap gently with screw driver to center and locate valve. Tighten screws securely. (Refer to Fig. 39). With valve in open position, stake screws, using pliers. **Do Not Lubricate any choke operating parts.** Hold air horn in an upright position and close choke valve. The valve should open freely of its own weight.

Install choke baffle plate and gasket. Hold choke coil housing against gasket with index mark in down position.

Turn choke coil housing counter-clockwise until index mark lines up with one notch rich mark on carburetor. Install heat tube cap gasket. Install heat tube cap with inlet hole pointing toward rear of engine. Install retainer ring, heat tube strap and screws, tighten securely.

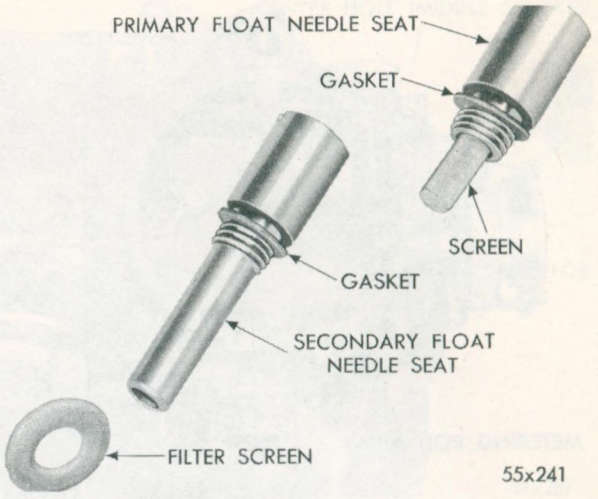

Fig. 60—Primary and Secondary Float Needle Seats and Screws

Invert air horn and install primary and secondary needle seats and gaskets. (The secondary seat has a tube extension, primary a small filter screen on end, (see Fig. 60). Tighten seats securely. Invert air horn and install new secondary filter screen and plug. Make sure screen is firmly seated.

Slide accelerator pump shaft and lever into air horn, just far enough to allow installation of accelerator pump arm. (See Fig. 37). Install pump arm with lever portion facing away from shaft (See Fig. 61). Continue to slide pump shaft into air horn until shaft protrudes from support boss. Install metering rod arm, (see Fig. 62). The lifter portion must be aligned with vacuumeter piston link slot in air horn casting. Install bowl vent operating arm with lever por-

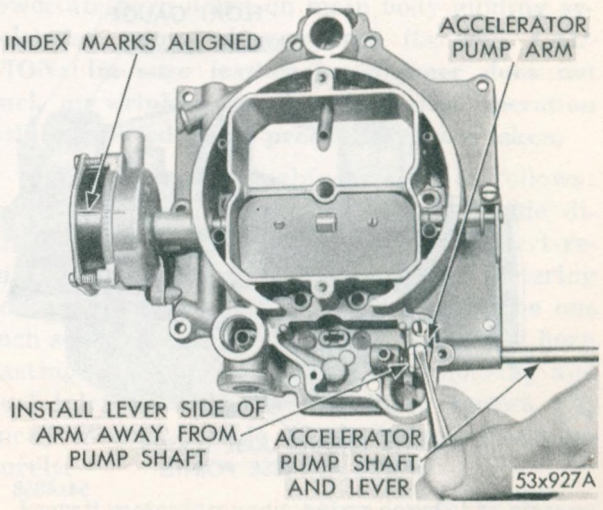

Fig. 61—Installing Accelerator Pump Arm

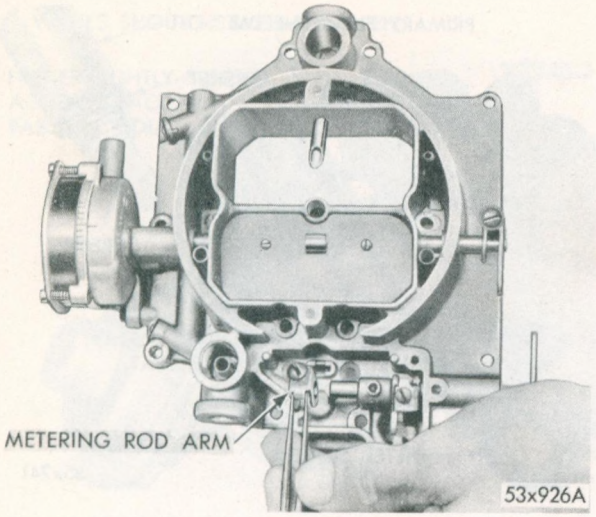

Fig. 62—Installing Metering Rod Arm

tion facing away from pump shaft. (Refer to Fig. 36). Install screw and lockwasher, **but do not tighten.**

Install fuel inlet filter screen, plug and gasket. Tighten securely. Slide vacuumeter piston link down into slot in air horn, with lifter lip facing away from pump shaft. Be sure metering rod tension spring is centered in hole at top of link. (As link is being lowered, engage lifter portion of arm in slot in link). Snug down clamp screws. Slide choke lever over end of choke shaft with lever pointing toward accelerator pump shaft. Snug down screw. (To be adjusted and positioned later).

Invert air horn and install primary needle valve in its seat. Slide primary float in position

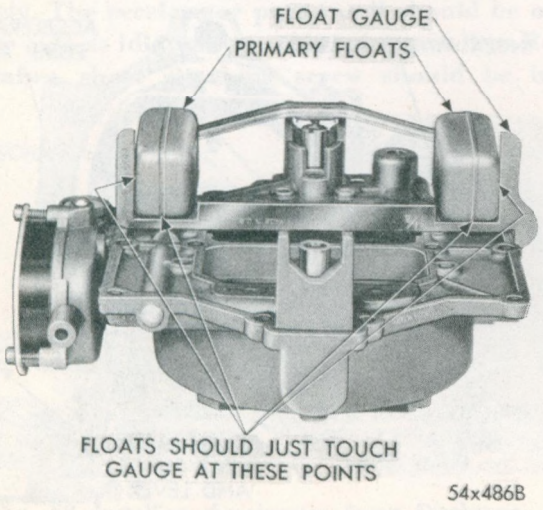

Fig. 63—Checking Primary Float Setting

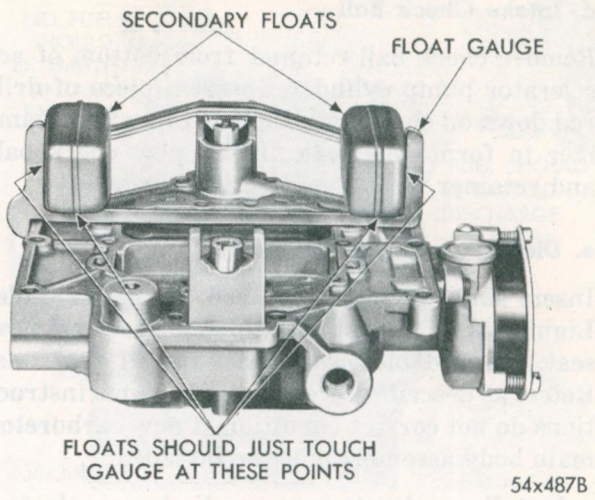

Fig. 64—Checking Secondary Float Setting

and install fulcrum in pin. Check float setting as follows: **Be sure each needle is installed in its original seat.**

g. Float Level Adjustment

When making float level adjustment, be sure air horn gasket is removed. The primary and secondary floats are set at different heights, using two separate gauges. Place primary float level gauge Tool T-109-236 ($\frac{5}{32}$ inch), in position, as shown in Figure 63. Both floats should just **CLEAR** horizontal section in gauge. Bend float arm as required to obtain correct setting. With notch end of gauge fitting against side of air horn casting, float arm should be bent for sideways adjustment, until floats barely touch the vertical upright of float gauge. (See Fig. 63). Repeat above instructions for secondary floats, using Tool T-109-284 ($\frac{9}{32}$ inch), as shown in Figure 64. It should be noted that distance be-

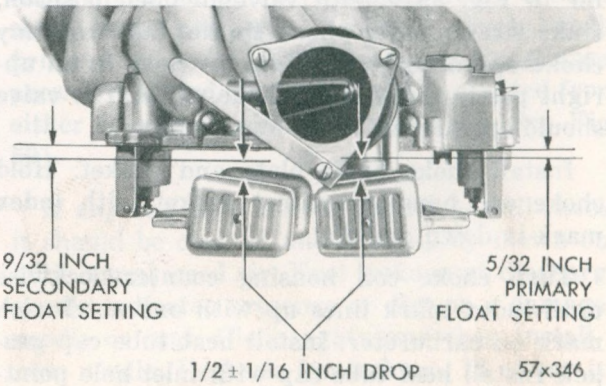

Fig. 65—Checking Float Drop

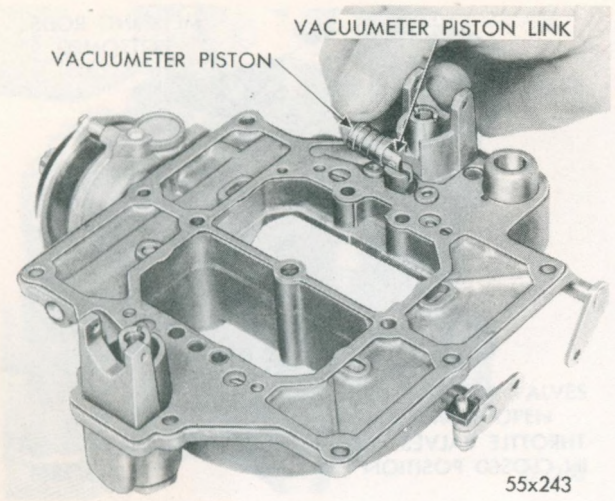

Fig. 66—Installing Vacuumeter Piston

tween float and casting machined surface is $\frac{5}{32}$ inch for primary and $\frac{9}{32}$ inch for secondary floats.

h. Float Drop Adjustment

After performing float level adjustment, hold air horn assembly in an upright position and note distance in which floats drop, as shown in Figure 65. Both primary and secondary floats should drop ½ inch from gauge setting (plus or minus $\frac{1}{16}$ inch), when measured at center floats, as shown in Figure 65. Adjust as necessary by removing float, and bending small tang which contacts float needle seat. Bend tang which contacts float needle seat. Bend tang towards needle seat to lessen drop, or away from seat to increase drop.

Invert air horn and remove floats. Install new air horn gasket, reinstall primary and secondary floats, and vacuumeter piston. Tilt piston approximately 90 degrees to either side. for correct installation position on vacuumeter

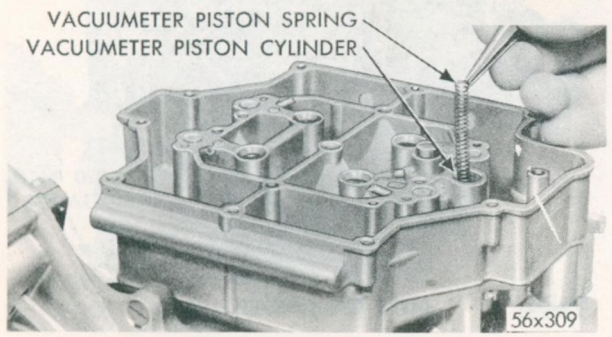

Fig. 67—Installing Vacuumeter Piston Spring

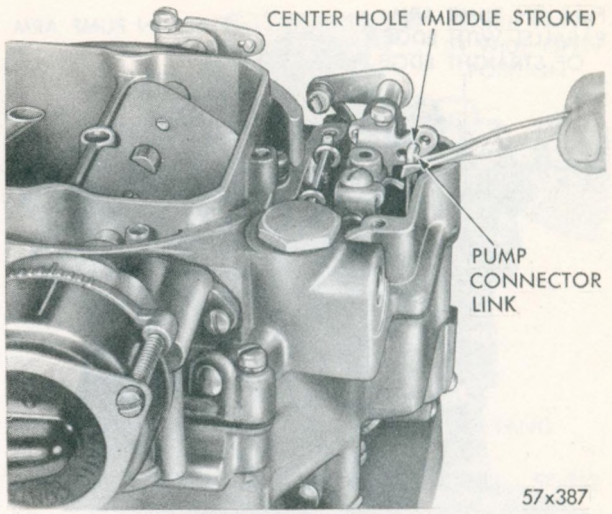

Fig. 68—Installing Accelerator Pump Connector Link

piston spring in main body, as shown in Figure 67.

Remove accelerator pump plunger from jar of gasoline and flex leather several times. Check to see if leather is hard, cracked or worn. If any afore-mentioned conditions exist, install new accelerator pump plunger. Slide accelerator pump plunger spring over plunger shaft followed by spring seat, (shoulder on seat toward spring). With spring compressed, slide shaft end into opening in air horn. With pressure on bottom of plunger, invert air horn and install accelerator pump connector link in center hole in arm and plunger as shown in Figure 68. Install hairpin clip to secure. **Before installing link, be sure hole in plunger shaft is parallel to pump shaft. Install link with hairpin clip groove end, entering hole in the pump arm.** Carefully, lower air horn down on main body guiding accelerator pump plunger into its well. **CAUTION: Be sure leather on plunger does not curl, or wrinkle. Accelerator pump operation will be affected if this precaution is not taken.**

Install air horn attaching screws as follows: Insert six 1¼ inch screws around inside diameter of air horn; tighten securely. Insert remaining 1¼ inch screw in its hole in metering rod chamber. Tighten securely. Insert the one inch screw in thick boss at corner of air horn casting, between automatic choke housing and fuel inlet port. Insert remaining screws (¾ inch) around outside of air horn, tighten securely.

Install metering rods, being careful to engage in loops on metering rod tension spring. (See

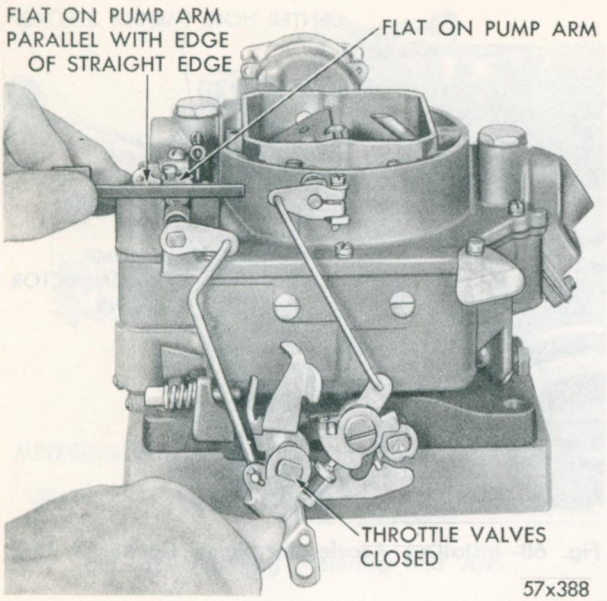

Fig. 69—Accelerator Pump Plunger Travel

Fig. 34). Install throttle connector rod and secure with clips. Engage keyed end of choke connector rod with slot in choke lever, rotate rod and engage in hole in cam trip lever. Install clip to secure. The carburetor now has been completely assembled with exception of metering rod cover, and is now ready to make following adjustments.

21. CARBURETOR ADJUSTMENTS

a. Accelerator Pump Adjustment

Before making this adjustment, be sure that pump connector link is installed in center hole (middle stroke of pump arm), with ends pointing toward pump shaft arm. Back off idle speed adjusting screw (if not previously done) until primary throttle valves are fully seated in their bores. (Make sure fast idle adjusting screw is off fast idle cam).

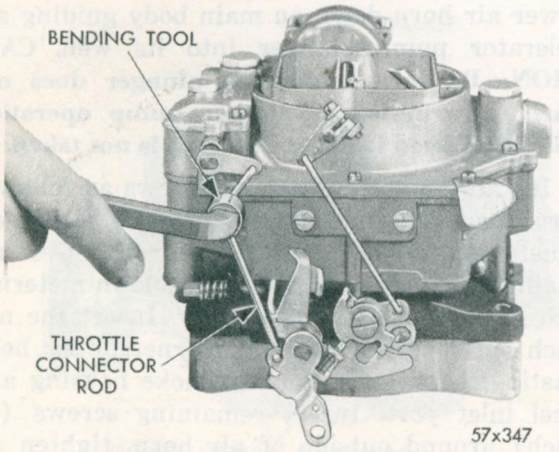

Fig. 70—Bending Connector Rod for Correct Plunger Travel

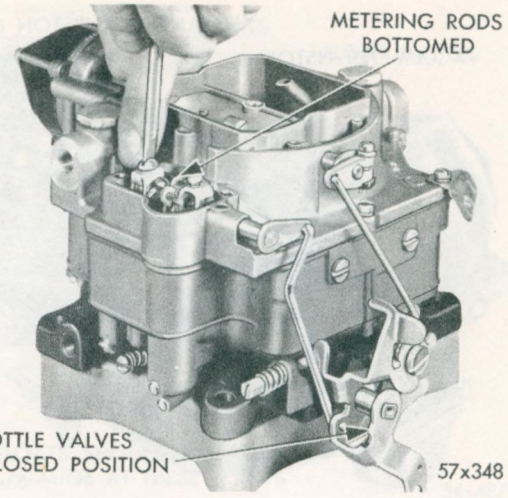

Fig. 71—Positioning Meter Rods

Hold straight edge across top of dust cover boss, as shown in Figure 69, and adjust length of connector rod until flat on top of pump arm (under set screw) is parallel with upper edge of straightedge. To adjust pump setting, bend throttle connector rod at the angle, using Tool T-109-213, as shown in Figure 70.

b. Positioning Metering Rods

Loosen set screw in metering rod arm (if previously tightened) enough to obtain a slight bind on pump shaft. Lift arm slightly. With

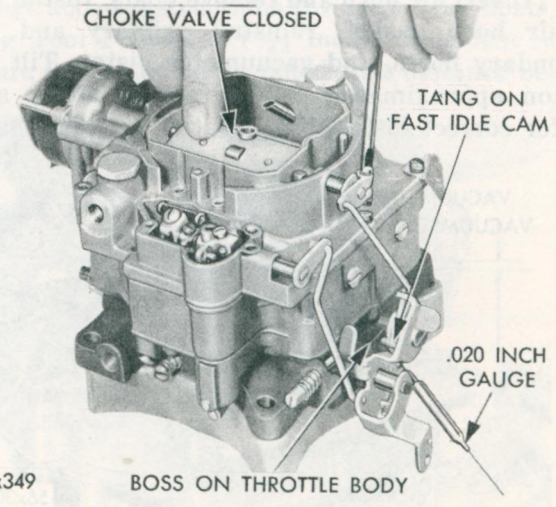

Fig. 72—Choke Rod Adjustment

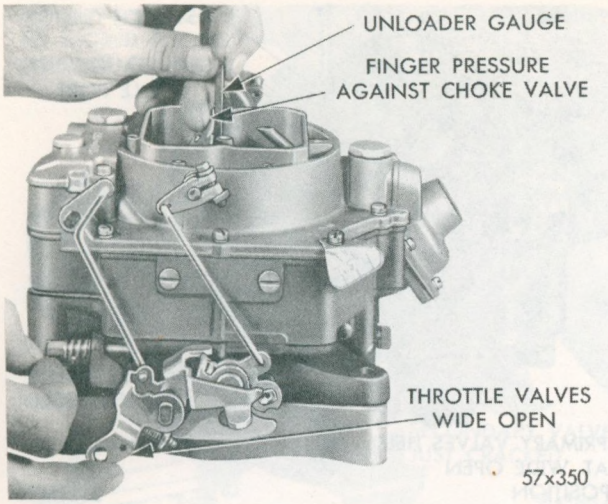

Fig. 73—Choke Unloader Adjustment

primary throttle valves seated in their bores, depress metering rod link until metering rods bottom, as shown in Figure 71. Keeping arm in contact with metering rod link, tighten set screw securely.

c. Choke Rod Adjustment

Loosen choke shaft lever clamp screw. Insert a .020 inch wire gauge Tool T-109-29, between tang on fast idle cam and boss on throttle body casting. Hold this gauge in place by pressure of screw driver exerted on choke shaft lever clamp screw, as shown in Figure 72. This will take up all slack in linkage. Hold choke valve tightly closed, and tighten clamp screw securely.

d. Choke Unloader Adjustment

With primary throttle valves held in wide open position, insert a $\frac{3}{16}$ inch drill or unloader gauge Tool T-109-28, between upper edge of choke valve and inner dividing wall of air horn,

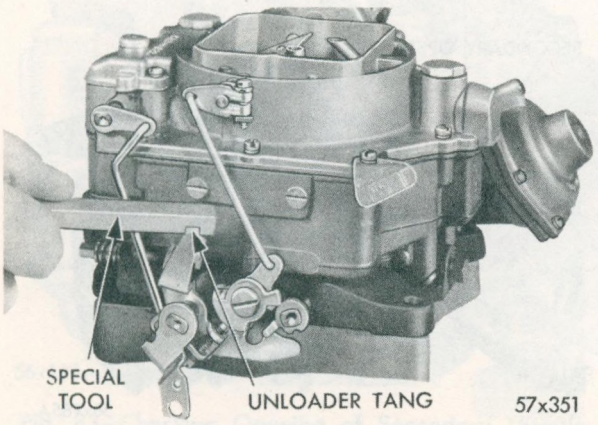

Fig. 74—Bending Unloader Tang

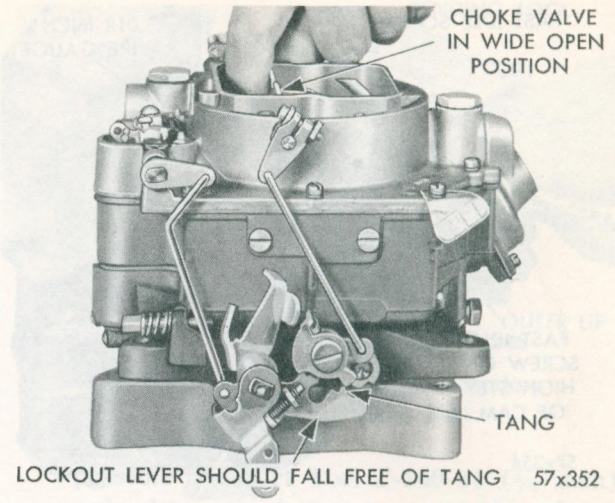

Fig. 75—Checking Secondary Throttle Lockout Release

as shown in Figure 73. With finger pressing lightly against upper part of choke valve, a slight drag should be felt on gauge as it is being withdrawn. If no drag is felt, or if too much drag is apparent, bend unloader tang on throttle lever, as shown in Figure 74, until correct clearance has been obtained. Use Tool T-109-41 to bend tang.

e. Secondary Throttle Lockout Adjustment

Move choke valve to wide open position, lockout lever should fall free of tang on secondary throttle shaft, as shown in Figure 75. Bend tang on secondary throttle lever until clearance has been obtained, as shown in Figure 76.

f. Fast Idle Adjustment

Insert .012 inch wire gauge, Tool T-109-200 between primary throttle valves and side of bore,

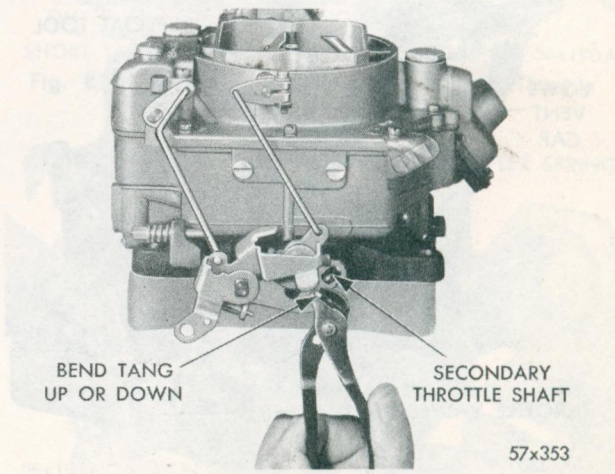

Fig. 76—Bending Throttle Shaft Tang to Obtain Clearance

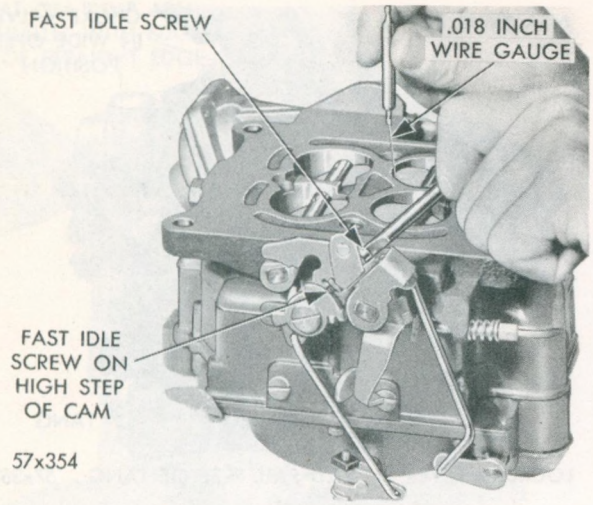

Fig. 77—Fast Idle Adjustment

opposite idle adjusting screws. Move choke valve to fully closed position, and adjust fast idle screw to give a slight drag on wire gauge when screw is resting on high step of fast idle cam, as shown in Figure 77.

The idle speed and mixture adjustments must be performed after installation of carburetor on engine. After these adjustments have been checked and corrected, install metering rod dust cover and gasket. Tighten screws securely.

g. Bowl Vent Cap Adjustment

With throttle valves closed, bowl vent cap should lift approximately 1/16 inch off its seat. Use Tool T-109-197, as shown in Figure 78 to check clearance. To increase clearance, remove metering rod dust cover and bend actuating

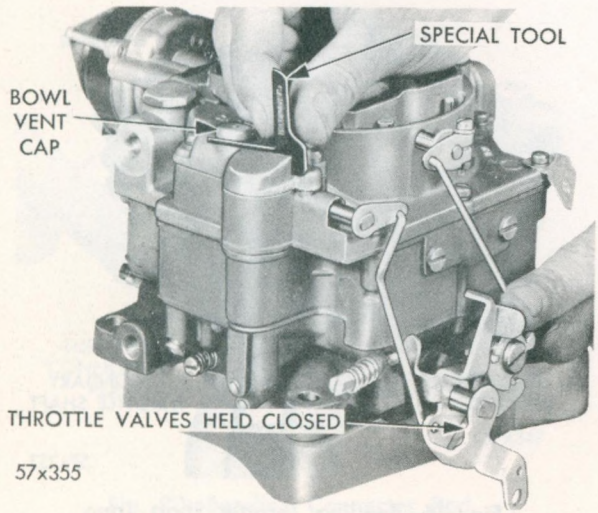

Fig. 78—Checking Bowl Vent Cap Lift

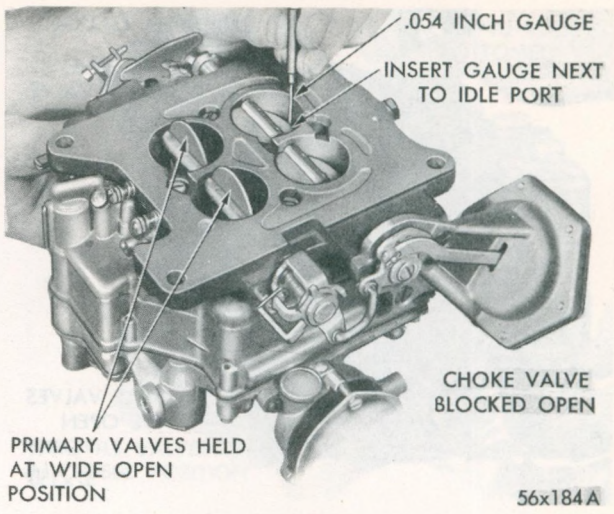

Fig. 79—Checking Opening of Secondary Throttle Valves (Step 1)

arm. To decrease lift, press down on cap until correct lift has been obtained.

h. Throttle Linkage Adjustment

To check throttle linkage for correct opening or positioning of secondary throttle valves in relation to primary throttle valves, it will be necessary to block choke valve in wide open position and invert carburetor. Proceed as follows:

(1) Open primary throttle valves to wide open position. It should then be possible to insert wire gauge Tool T-109-193. (.054 inch), between upper edge of secondary throttle valves, (next to idle port) and bore of carburetor, as shown in Figure 79.

Using Tool T-109-213, bend secondary operating rod, as shown in Figure 80, until correct clearance of .054 inch has been obtained.

(2) Close primary throttle valves until it is

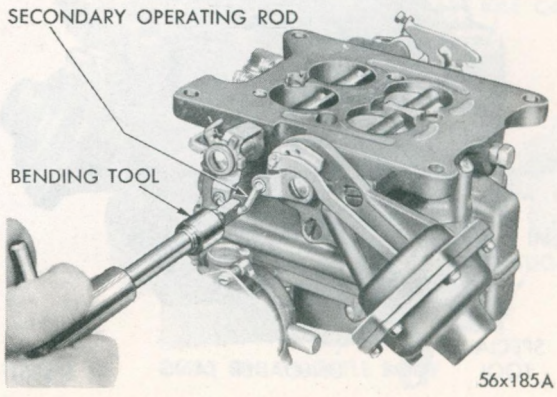

Fig. 80—Bending Secondary Operating Rod

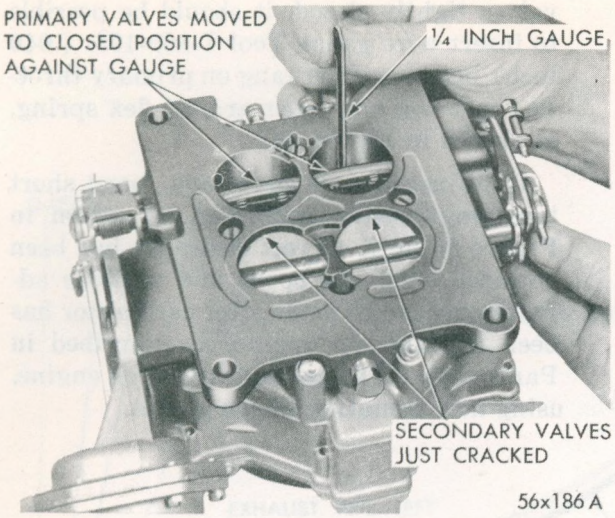

Fig. 81—Checking Opening of Secondary Throttle Valves (Step 2)

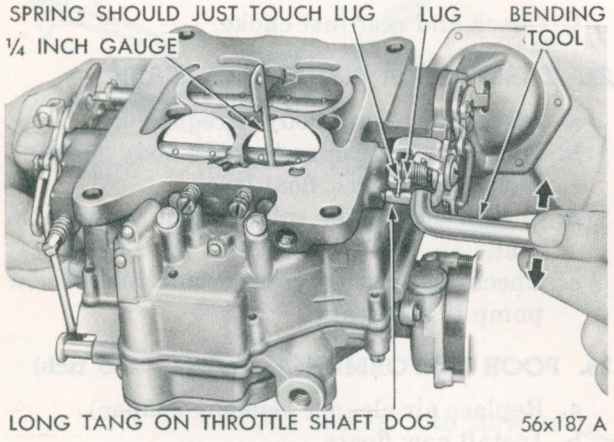

Fig. 82—Bending Tang on Throttle Shaft Dog (Step 2-A)

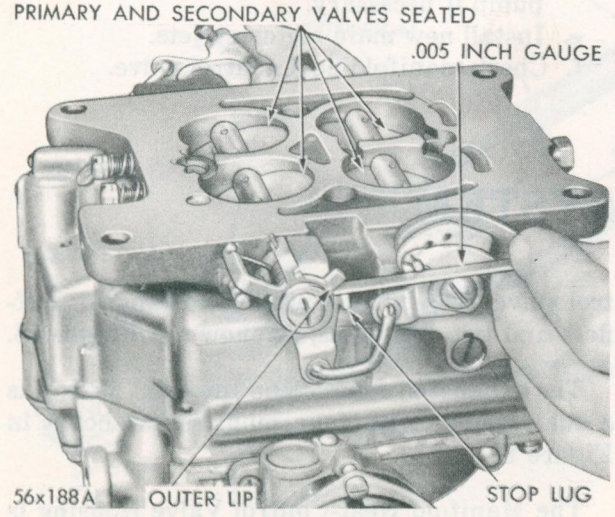

Fig. 83—Checking Opening of Secondary Throttle Valves (Step 3)

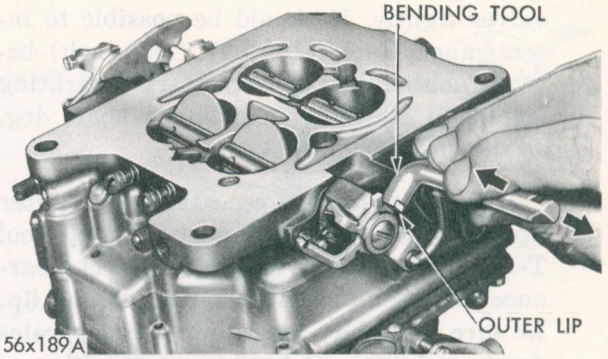

Fig. 84—Bending Outer Lip of Secondary Operating Lever (Step 3-A)

possible to insert Tool T-109-31 (¼ inch) unloader gauge between *upper* edge of primary throttle valve and bore (next to idle port), as shown in Figure 81. In this position, secondary throttle valves should just crack open.

If an adjustment is necessary, bend tang on throttle shaft dog, using Tool T-109-214, as shown in Figure 82, until inner arm of flex spring just contacts inner lug of secondary operating lever.

(3) Close primary and secondary throttle

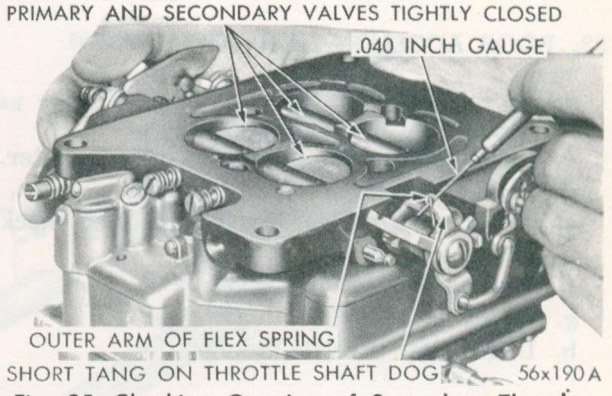

Fig. 85—Checking Opening of Secondary Throttle Valves (Step 4)

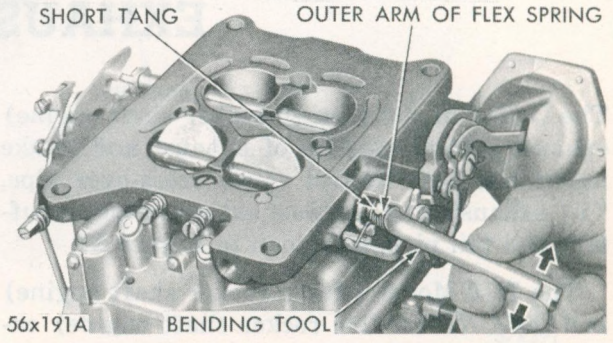

Fig. 86—Bending Short Tang on Throttle Shaft Dog (Step 4-A)

valves tightly. It should be possible to insert gauge, Tool T-109-237. (.005 inch) between outer lip of secondary operating lever and stop lug on primary shaft dog, as shown in Figure 83.

If an adjustment is necessary, bend outer lip of secondary operating lever, using Tool T-109-214 in Figure 84, until correct clearance has been obtained. **After bending lip, be sure secondary operating lever operates freely and does not bind in any position.**

(4) With primary and secondary throttle valves tightly closed, it should be possible to insert wire gauge Tool T-109-193. (.040 inch) between short tang on primary throttle shaft dog and outer arm of flex spring, as shown in Figure 85.

If adjustment is necessary, bend short tang on throttle shaft dog, as shown in Figure 86 until correct clearance has been obtained. The idle speed and mixture adjustments can be made after carburetor has been installed on engine, as described in Paragraph 16. Install carburetor on engine, using new mounting flange gasket.

SERVICE DIAGNOSIS

22. POOR IDLING

- a. Tighten main to throttle body screws.
- b. Check and adjust float level.
- c. Install new idle mixture needles.
- d. Install new throttle shaft or body.
- e. Clean idle discharge holes.
- f. **Clean carburetor and idle bleed.**

23. POOR ACCELERATION

- a. Clean accelerator pump by-pass jet.
- b. Install new accelerator pump.
- c. Clean accelerator pump discharge cluster.
- d. Clean vacuum piston and cylinder.
- e. Install new accelerator pump inlet check valve.
- f. Check and reset float level.
- g. Install new needle valve and seat.
- h. Install new throttle linkage.
- i. Check and readjust choke.

24. CARBURETOR FLOODS OR LEAKS

- a. Install new main body if required.
- b. Install new air horn to main body gasket.
- c. Check and adjust float level.
- d. Install new fuel inlet needle valve and seat.
- e. Check fuel pump pressure and install new pump if necessary.

25. POOR PERFORMANCE—(mixture too rich)

- a. Replace air cleaner element (paper).
- b. Install new floats.
- c. Check float level and adjust if necessary.
- d. Check fuel pump pressure and install new pump if necessary.
- e. Install new main metering jets.
- f. Check manifold heat control valve.

EXHAUST SYSTEM

The C-75-1 Model (Single rocker shaft engine) exhaust system consists of exhaust and intake manifolds, heat control valve, cross-over pipe, "Y" exhaust pipe, exhaust extension pipe muffler, and tail pipe, as shown in Figure 87.

The 75-2 Model (single rocker shaft engine) and the C-76 (double rocker shaft engine) exhaust system is dual exhaust system which consists of exhaust and intake manifolds, heat control valve, two exhaust pipes, two exhaust mufflers and two tail pipes, as shown in Figure 88.

The exhaust system of the Imperial Models is a dual system with four mufflers as shown in Figure 89.

The Manifold Heat-Control Valve Housing is now cast integral with the Right Exhaust Manifold on all models.

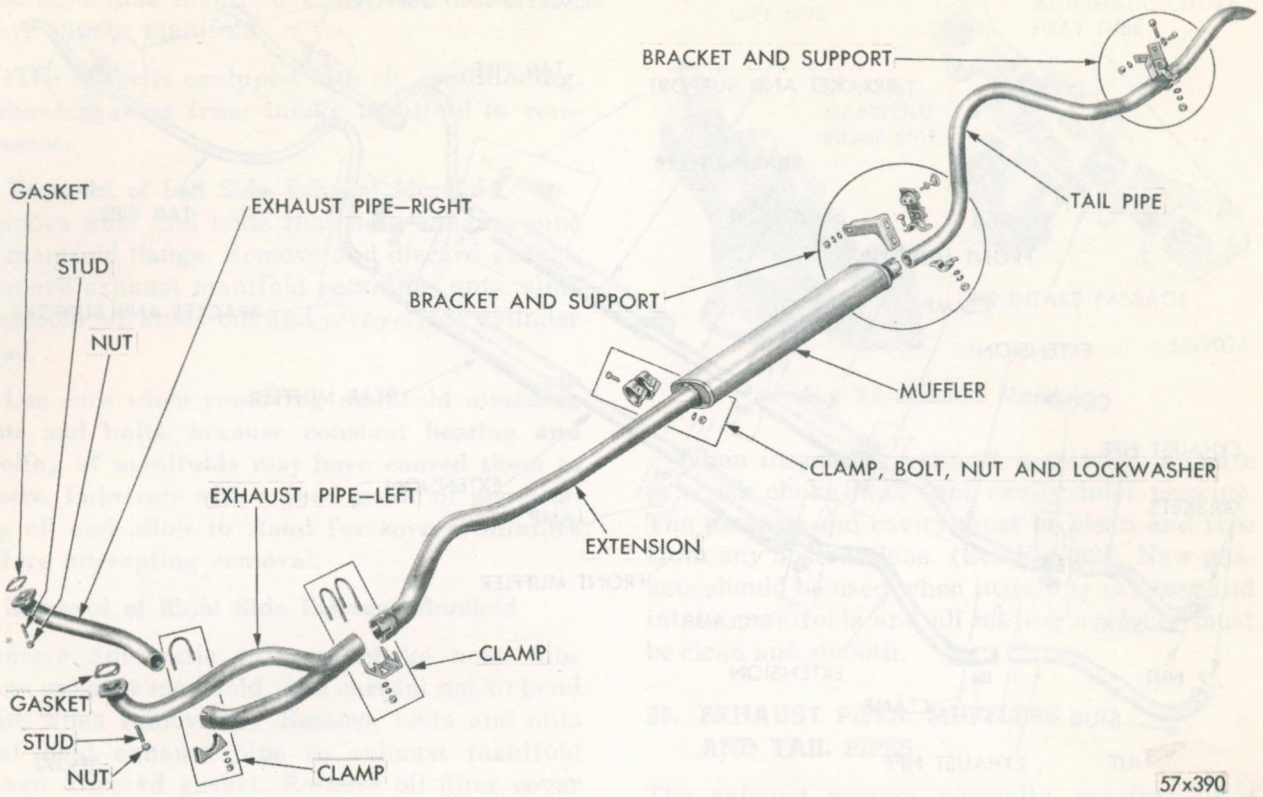

Fig. 87—Exhaust System (Single Rocker Shaft Engine)

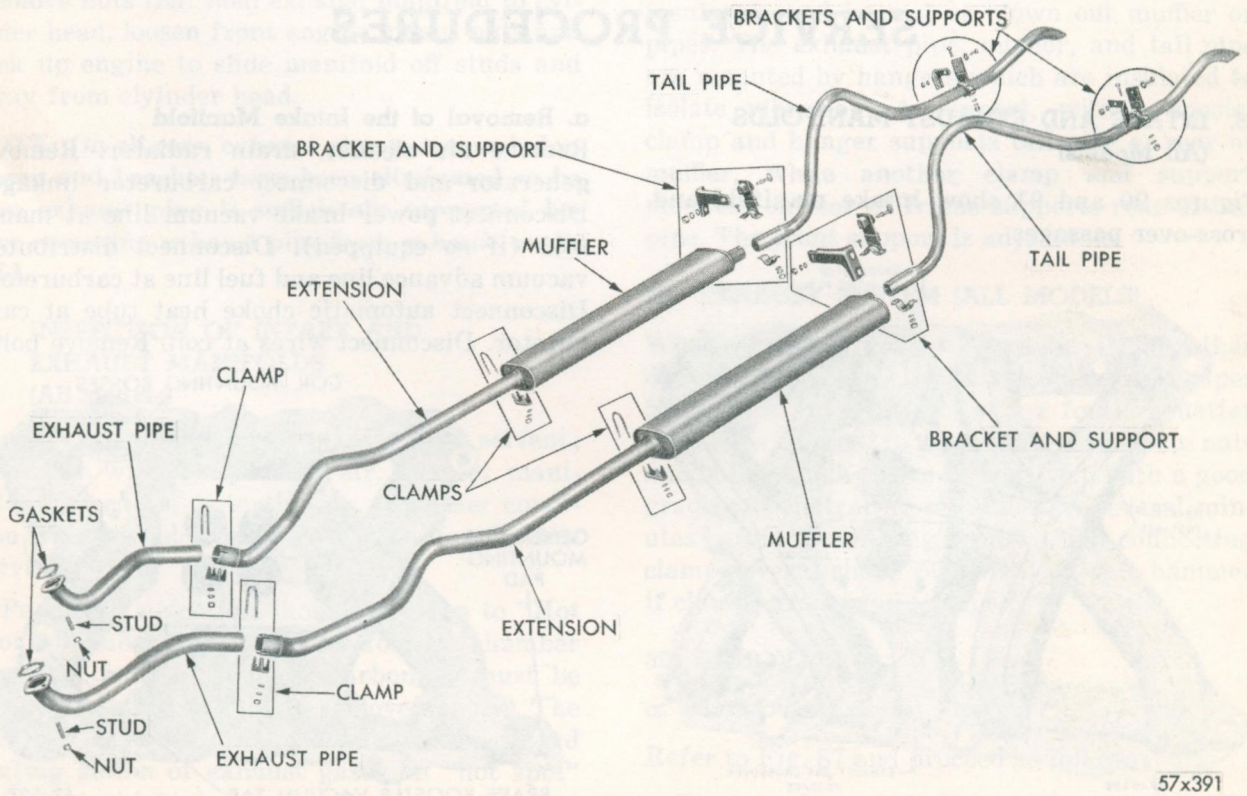

Fig. 88—Dual Exhaust System (Models C-75-2; C-76)

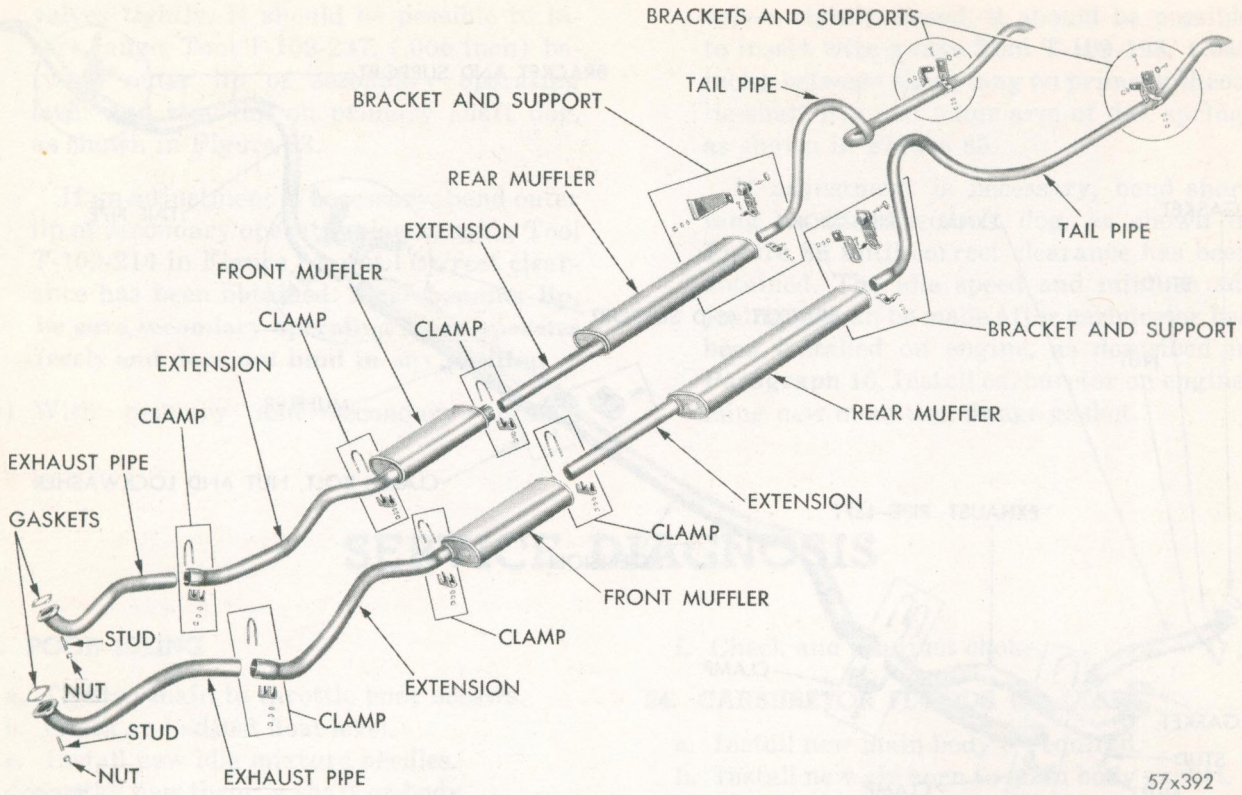

Fig. 89—Dual Exhaust System (Models 1m, 1, 2, and 4)

SERVICE PROCEDURES

26. INTAKE AND EXHAUST MANIFOLDS (All Models)

Figures 90 and 91 show intake manifold and cross-over passages.

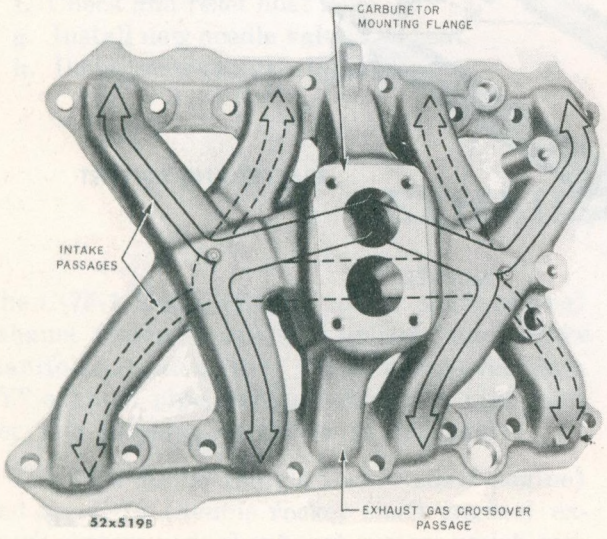

Fig. 90—Intake Manifold (Single Rocker Shaft Engine)

a. Removal of the Intake Manifold

Remove air cleaner, drain radiator. Remove generator and disconnect carburetor linkage. Disconnect power brake vacuum line at manifold (if so equipped). Disconnect distributor vacuum advance line and fuel line at carburetor. Disconnect automatic choke heat tube at carburetor. Disconnect wires at coil. Remove bolts

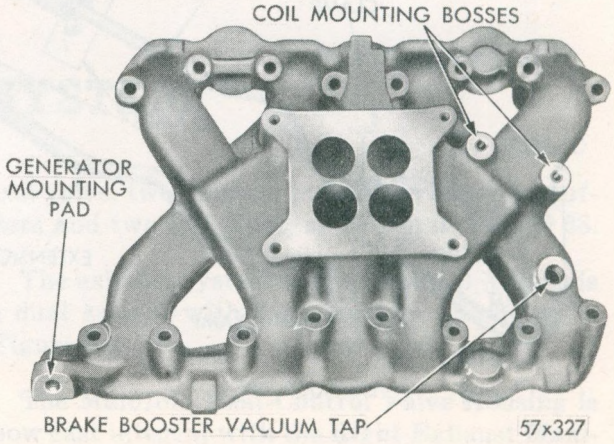

Fig. 91—Intake Manifold (Double Rocker Shaft Engine)

holding intake manifold to cylinder head. Remove intake manifold.

NOTE: If car is equipped with air conditioning, remove bracket from intake manifold to compressor.

b. Removal of Left Side Exhaust Manifold

Remove nuts and bolts that hold exhaust pipe to manifold flange. Remove and discard gasket. Remove exhaust manifold retaining nuts, slide manifold off studs out and away from cylinder head.

Use care when removing manifold attaching nuts and bolts, because constant heating and cooling of manifolds may have caused them to freeze. Lubricate with a good grade of penetrating oil and allow to stand for several minutes before attempting removal.

c. Removal of Right Side Exhaust Manifold

Remove automatic integral choke heat tube from exhaust manifold. (Be careful not to bend tube when removing.) Remove bolts and nuts that hold exhaust pipe to exhaust manifold flange. Discard gasket. Remove oil filter cover and element. Remove bolt and clamp that hold ground cable and heat tube to cylinder head. Remove nuts that hold exhaust manifold to cylinder head, loosen front engine mount nuts and jack up engine to slide manifold off studs and away from clyinder head.

NOTE: On all cars, exhaust pipe to transmission clamp and brackets have been eliminated so be sure exhaust pipe is sufficiently supported before removing exhaust pipe from exhaust manifold.

27. INSPECTION OF INTAKE AND EXHAUST MANIFOLDS (All Models)

Clean intake and exhaust manifolds in solvent; blow dry with compressed air. Inspect manifolds for cracks, distortion, or any other condition which would make them unfit for further service.

Particular attention should be given to "Hot spot" chamber in intake manifold. If chamber is coated with hard black carbon, it must be scraped or sand blasted to remove deposit. The layers of carbon act as an insulator and retard heating action of exhaust gases on "hot spot" chamber which, in turn, affects vaporization rate of fuel passing through intake manifold.

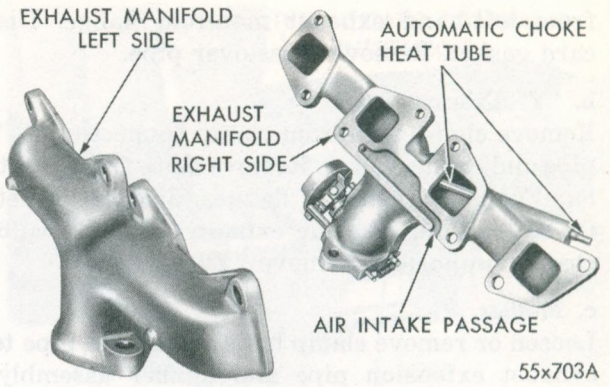

Fig. 92—Exhaust Manifold

When inspecting exhaust manifolds, be sure to check choke heat tube cavity inlet passage. The passage and cavity must be clean and free from any obstructions. (See Fig. 92). New gaskets should be used when installing exhaust and intake manifolds and all mating surfaces must be clean and smooth.

28. EXHAUST PIPES, MUFFLERS AND TAIL PIPES

The exhaust system normally requires little service. The system should be checked periodically for leaking gaskets, broken supports or insulators and burned or blown out muffler or pipes. The exhaust pipe, muffler, and tail pipe are mounted by hangers which are insulated to isolate vibration. A support, with a special clamp and hanger supports tail pipe at rear of muffler, while another clamp and support mounted on rear of frame supports rear of tail pipe. The front support is adjustable.

29. EXHAUST SYSTEM (ALL MODELS)

When servicing exhaust system, it is rather difficult to remove clamps and disconnect pipes because of rust, dirt, or other foreign matter which has adhered to these parts. Lubricate nuts and bolts, which are to be removed, with a good grade of penetrating oil and wait several minutes before attempting removal. Hit connecting clamp several sharp blows with a soft hammer if clamps are rusted to pipes.

30. REMOVAL

a. Cross-Over Exhaust Pipe

Refer to Fig. 87 and proceed as follows:

Remove clamp bolt from clamp at "Y" pipe and cross-over pipe connection. Remove bolts

from left-hand exhaust manifold flange. Discard gasket. Remove cross-over pipe.

b. "Y" Exhaust Pipe

Remove clamp bolt from clamp connecting "Y" pipe and exhaust pipe. Remove bolts from right-hand exhaust manifold flanges, discard gasket. **On all cars be sure the exhaust system is sufficiently supported.** Remove "Y" pipe.

c. Muffler

Loosen or remove clamp bolts at exhaust pipe to exhaust extension pipe and muffler assembly. Remove muffler and extension pipe assembly.

d. Tail Pipe

Remove clamp bolt from front tail pipe bracket. Remove clamp bolt from rear tail pipe bracket. Jack up frame to relieve body weight from rear springs, remove tail pipe.

NOTE: In most instances where clamps are used, they will have to be spread before pipes can be removed.

31. INSTALLATION

When installing components of exhaust system start at exhaust manifolds and work toward rear until muffler is to be installed. Position tail pipe, install muffler. If entire exhaust system, or any component of it is being replaced, clamps and brackets should be tightened only to extent necessary to hold exhaust system in position. The final tightening is done after system has been properly aligned.

32. DUAL EXHAUST SYSTEM

The dual exhaust system is standard equipment on the C75-2, C76 models.

The service procedure for dual exhaust system (removal, installation and alignment) will be comparable to exhaust system for the C-75 with following exceptions.

In dual exhaust system, cross-over and "Y" exhaust pipes are not used; there is an individual exhaust pipe, muffler and exhaust extension pipe and tail pipe for each cylinder bank. (Refer to Fig. 88).

33. ALIGNMENT OF EXHAUST SYSTEMS

Figs. 87, 88, and 89 illustrate various types of supports, insulators and clamps with procedures as follows:

Tighten exhaust manifold flange studs and nuts evenly, 40 foot-pounds torque. Install muffler and tail pipes and leave clamp bolts loose in order to align entire system. Check muffler and tail pipes so that clearance of ½ inch is maintained between frame, floor pan, bumper, shock absorber and fuel tank. Tighten all clamp bolts and brackets to 20 foot-pounds torque.

MANIFOLD HEAT CONTROL VALVE

34. DESCRIPTION

The manifold heat control valve, as shown in Fig. 93, is controlled by a thermostatic coil spring, counterweight, and velocity of exhaust gas through exhaust manifold. The thermostatic coil spring is installed in a manner which will maintain sufficient tension on valve shaft to keep valve in closed position when engine is cold.

In closed position, hot gases circulate up and around "hot spot" chamber in intake manifold. This, in turn, preheats vaporized fuel passing down through manifold, resulting in smooth engine performance.

NOTE: Should heat control valve become stuck in either open or closed position car performance would be affected.

35. TESTING MANIFOLD HEAT CONTROL VALVE

Inspect operation of heat control valve peri-

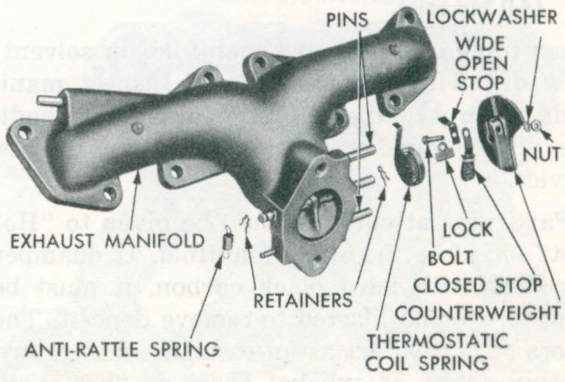

Fig. 93—Manifold Heat Control Valve

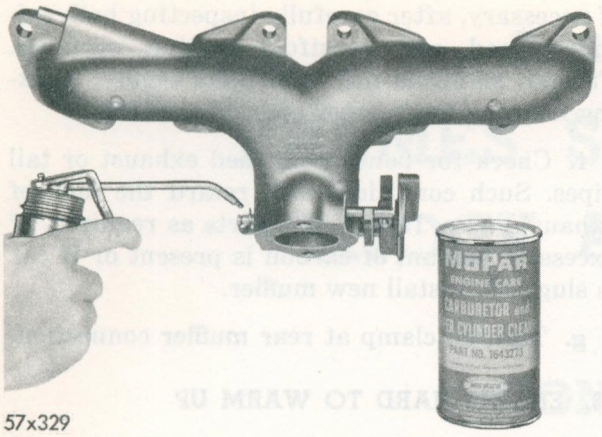

Fig. 94—Lubricating the Valve Shaft

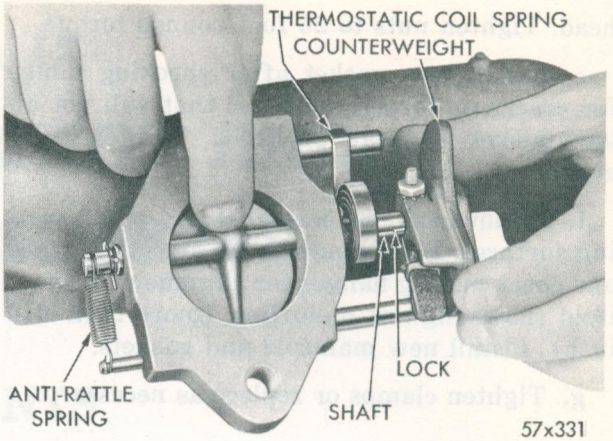

Fig. 96—Installing the Heat Control Valve Counterweight

odically. With engine idling (car standing) accelerate to wide open throttle and release quickly. The counterweight should respond by moving clockwise approximately ½ inch and returning to its normal position. If no movement is observed, the valve shaft may be frozen or coil spring is weak or broken. In either case, heat control valve should be disassembled and replaced with new parts.

a. Disassembly

Refer to Fig. 93 and proceed as follows:

Loosen retaining nut and remove counterweight, lock and stop from end of shaft, exposing the thermostatic coil spring. Unhook coil spring from pin and remove by prying out of valve shaft slot. If valve shaft is frozen in manifold, apply Mopar Engine Care to both ends of shaft as shown in Figure 94, and allow to stand several minutes. Loosen by turning shaft clockwise or counter-clockwise (depending on frozen position) until shaft is free. Work shaft from closed to open position several times until shaft can be turned very easily with fingers.

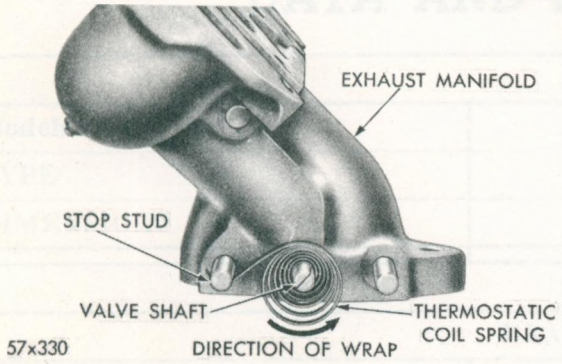

Fig. 95—Positioning the Thermostatic Coil Spring

b. Assembly

Before installing heat control valve on engine, **lubricate valve shaft with graphite paste.** Position valve shaft in extreme counter-clockwise position. Place new coil spring in position over shaft slot, with outer end tongue of spring in upper left-hand position. Press inner end of coil into slot of shaft and seat firmly.

Move outer end tongue of spring around and hook under pin, as shown in Fig. 95. Place counterweight over shaft (with shield in upward position) and insert lock in shaft slot, as shown in Fig. 96. Center counterweight on shaft and turn assembly clockwise until stop passes the pin. Press counterweight on shaft until seated, install stop, and tighten nut securely with Tool T-109-173. Test valve for proper operation.

SERVICE DIAGNOSIS

36. EXCESSIVE EXHAUST NOISE

a. Check for leaks.

b. Check system for bind. Loosen all hangers and test car by driving.

c. Check complete exhaust system for sign of failure, repair as required.

d. Install new gaskets as required after checking exhaust manifold for distortion. Be sure manifold registers evenly with cylinder

head. Tighten nuts to 25 foot-pounds torque.

e. Install new gasket after checking flange for cracks or foreign material that will not allow gasket to seat properly. Tighten bolts evenly.

f. Remove exhaust manifold and check mating surfaces. Place manifold on smooth surface and check mating flanges for alignment. If manifold shows sign of distortion (more than .010 inch), install new manifold and gaskets.

g. Tighten clamps or replace as necessary.

37. LEAKING EXHAUST GASES

a. Locate leak and correct.

b. Install new manifold and gaskets, if necessary.

c. Check complete system for alignment and adjust as required. A leaking connection will be indicated by black streaks along pipes.

d. Install new muffler and tail pipes if needed. Check alignment of exhaust pipes, muffler and tail pipe. Align as necessary.

e. Remove manifold and install new gaskets if necessary, after carefully inspecting both cylinder head and manifold mating surfaces. Tighten manifold nuts and bolts evenly, working from center to outer ends of manifold.

f. Check for bent or pinched exhaust or tail pipes. Such conditions will retard the flow of exhaust gases. Install new parts as required. If excessive amount of carbon is present or if car is sluggish, install new muffler.

g. Tighten clamp at rear muffler connection.

38. ENGINE HARD TO WARM UP

a. Check operation of heat control valve and make necessary repairs.

39. MANIFOLD HEAT CONTROL VALVE RATTLE

a. Check for broken thermostatic spring and make necessary correction.

b. Check for weak or broken anti-rattle spring and make necessary repairs or replacement.

c. Check shaft for looseness in body and correct condition as necessary.

Section IX

FRAMES, SPRINGS AND SHOCK ABSORBERS

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Servicing the Oriflow Shock Absorbers	204

DATA AND SPECIFICATIONS

FRAME			
Models	**C-75**	**C-76**	**IM-1, 2 & 4**
TYPE	Welded, Double-Channel Box Section, Side-Rails		
DIMENSIONS	See Figures 1, 2, and 3		

REAR SPRINGS			
TYPE		Semi-Elliptic	
NO. OF LEAVES			
SEDANS	5½	6½	6½
TOWN & COUNTRY WAGON	6½	6½	—
WIDTH	2.5	2.5	2.5
LENGTH	58″	58″	58″
SHACKLE	Silent Block Rubber Bushings		
HANGER	Side Strapped with Rubber Bushed Bolts		

SHOCK ABSORBERS

Models	C-75	C-76	IM-1, 2 & 4
TYPE	Oriflow, Double Acting, Hydraulic		

TORQUE SPECIFICATIONS		Foot-Pounds
REAR SPRING SILENT BLOCK NUT		100
SHOCK ABSORBER STUD NUT	1/2" UPPER.....	60
	9/16" LOWER.....	70
REAR SPRING U-CLIP BOLT NUTS		70
REAR SPRING SHACKLE NUTS 7/16"		50
SHOCK ABSORBER MOUNT NUT (REAR)		60

ESSENTIAL TOOLS

C-3413.....Remover and Installer—Shock Absorber Lower Mounting Assembly

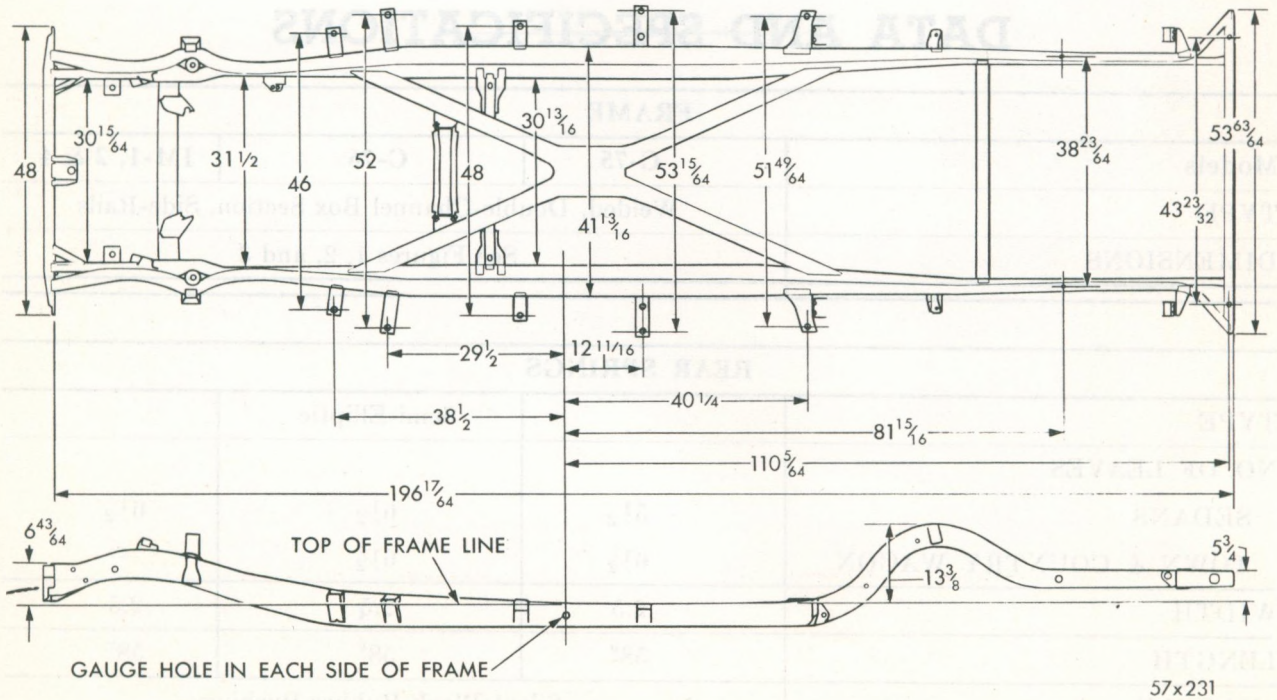

Fig. 1—Frame Dimensions, Windsor and New Yorker

SECTION IX

FRAMES, SPRINGS AND SHOCK ABSORBERS

FRAME

A new full length box section frame with redesigned crossmembers and longer side rails are used on 1957 Chrysler Models.

Two front crossmembers are now used, the forward member for bumper, radiator support and strut attachment and the other for engine and suspension support.

The convertible coupe frames have X-members as formerly, to reduce the increased body shake that is inherent in this model and improve frame to body attachment. A frame to rear axle control strut is continued for the Imperial Models. (See Paragraph 8, "Universal Joint", Section XII, for adjustment procedures).

1. CHECKING FRAME DIMENSIONS

In case of collision, frame members can often be satisfactorily straightened to the required dimensional limits. In case of serious damage or fracture to front crossmembers, upper and lower control arms and steering knuckle, the component parts, ball joints and steering arms should be replaced.

CAUTION

Under no circumstances should the control arms, knuckles, steering arms or torsion bars be heated for straightening. Heating these parts will anneal the metal and lower their strength to a point which will make them dangerously weak for further use.

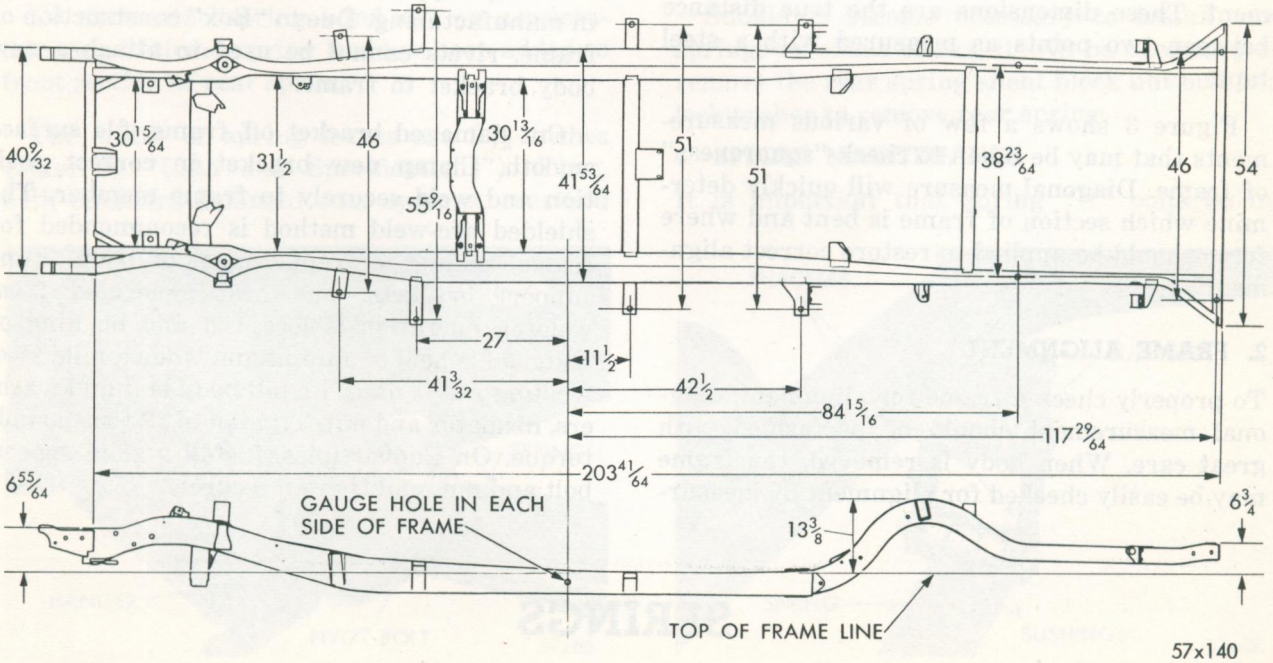

Fig. 2—Frame Dimensions, Imperial

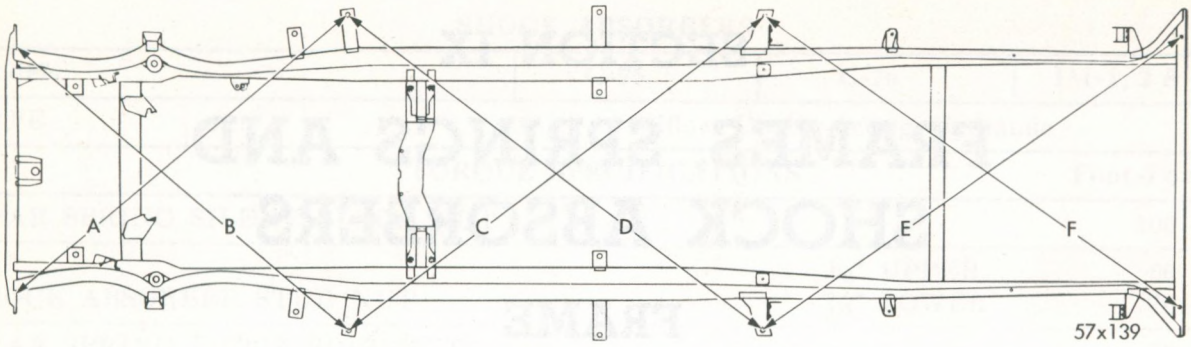

Fig. 3—Typical Frame Diagonal Measurements

Before a member is replaced, it is essential that frame alignment be checked and corrected if necessary. Whenever possible, parts should be securely fastened with hot rivets. In cases where no riveting equipment is available, finished bolts snugly fitted in reamed holes may be used. The nuts should be securely tightened and non-spreading lockwashers used. (Cold rivets are not recommended unless adequate power press equipment is available to do a secure riveting job.) When welding frame members, care must be taken to localize the heat so that the steel hardness of frame will be retained. Reinforcement welds should run lengthwise, along side of reinforcement.

Figures 1, 2, and 3 show various dimensions to be used as a guide for checking frame alignment. These dimensions are the true distance between two points as measured with a steel tape.

Figure 3 shows a few of various measurements that may be taken to check "squareness" of frame. Diagonal measure will quickly determine which section of frame is bent and where force should be applied to restore correct alignment.

2. FRAME ALIGNMENT

To properly check a frame for alignment, diagonal measurement should be performed with great care. When body is removed, the frame may be easily checked for alignment by measuring diagonals, as shown in Figure 3, with trammels or steel tape and check dimensions given in Figs. 1, 2 and 3. Measurements may be taken without removing body from chassis by using plumb-bob and chalk line on level floor.

Attach line of plumb-bob to one of rear body bolts. The plumb-bob should be suspended slightly above floor. When plumb-bob comes to rest, mark floor directly underneath it. The marks made on floor will represent various points of frame to be checked diagonally. Move car away so the distance can be measured to compare with the diagonal measurements, shown in Figures 1, 2 and 3.

3. REPLACING BODY SUPPORT BRACKETS

The body support brackets are welded to frame in manufacturing. Due to "Box" construction of frame, rivets cannot be used to attach a new body bracket to frame.

Cut damaged bracket off frame, file surface smooth. Clamp new bracket in correct position and weld securely to frame member. The shielded arc-weld method is recommended for frame welding, or replacement of body frame support brackets. The heat generated from welding operation is localized and burning of material is held to a minimum when a mild steel welding rod is used. Install body bolt and washers, insulator and nut. Tighten to 18 foot-pounds torque. On Convertibles, install a solid spacer, bolt and nut, and tighten securely.

SPRINGS

The rear springs (Fig. 4) are of the semi-elliptical design. The front ends of rear springs are mounted outboard of the frame side rails and attached to hangers. (See Fig. 5).

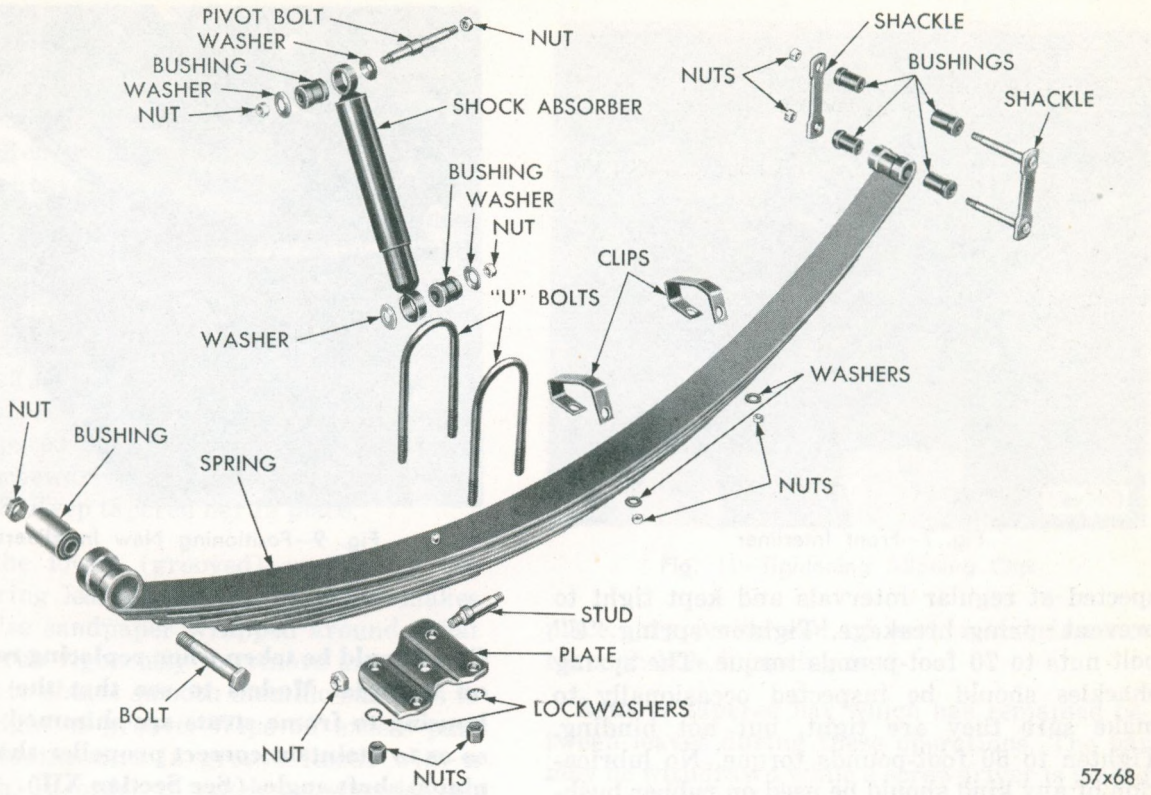

Fig. 4—Typical Rear Springs Suspension (Disassembled View)

The front and rear spring shackle bolts are cushioned in rubber which tends to reduce road noise to a minimum. (No lubrication is required at the rear shackles.) (See Fig. 6).

To eliminate "spring wind-up" on acceleration an additional spring leaf has been added to front section of rear spring.

The width of spring leaves are 2½ inches (refer to "Data and Specifications"). Thus, with outboard-mounted rear springs, rear-end roll is greatly reduced and car stability on curves or sharp turns is maintained.

NOTE: Cars equipped with air conditioning units are equipped with a heavier rear spring.

Should it become necessary to install new springs or silent blocks, it will be necessary to remove the rear spring silent block nut bolt and lockwasher to remove rear spring.

4. SPRING MAINTENANCE

It is important that spring "U" bolts be in-

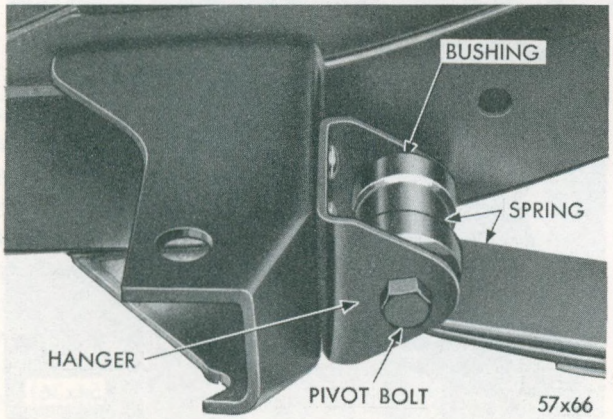

Fig. 5—Rear Springs Front Mounting

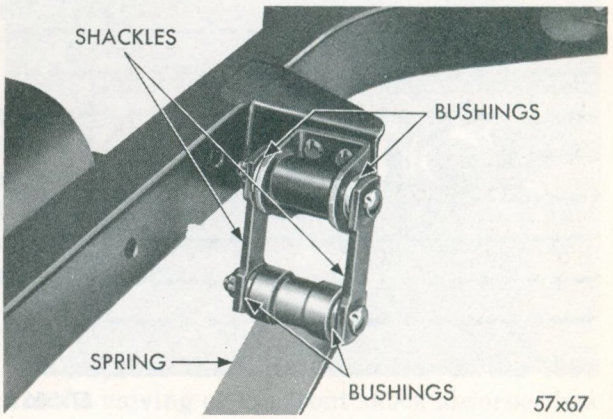

Fig. 6—Rear Spring Shackles

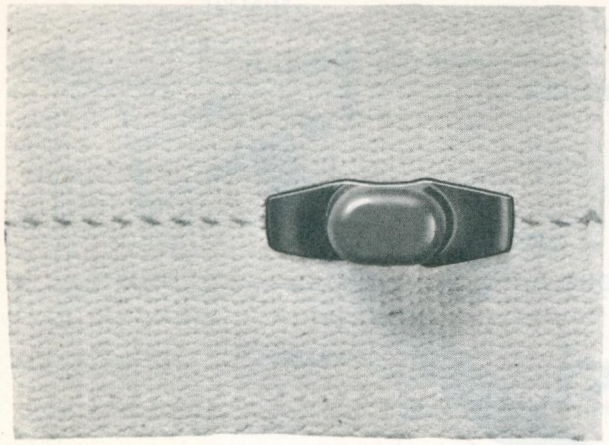

Fig. 7—Front Interliner

spected at regular intervals and kept tight to prevent spring breakage. Tighten spring "U" bolt nuts to 70 foot-pounds torque. The spring shackles should be inspected occasionally to make sure they are tight, but not binding. Tighten to 50 foot-pounds torque. No lubrication of any kind should be used on rubber bushings.

The height of the car may be affected if rear spring height varies more than ¾ inch on one side as compared with other side. To check this, measure vertical distance from top of rear spring main leaf to underside of frame side rail on both sides of car. If these distances differ by more than ¾ inch, this is an indication that one of rear springs may need to be replaced. This condition could also be due to a bent frame kick-up or an incorrectly welded spring saddle.

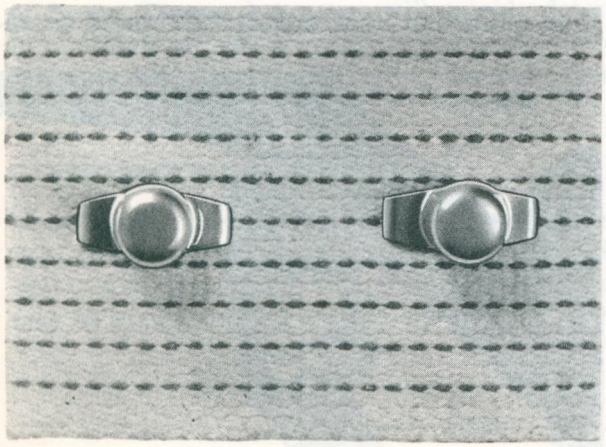

Fig. 8—Rear Interliner

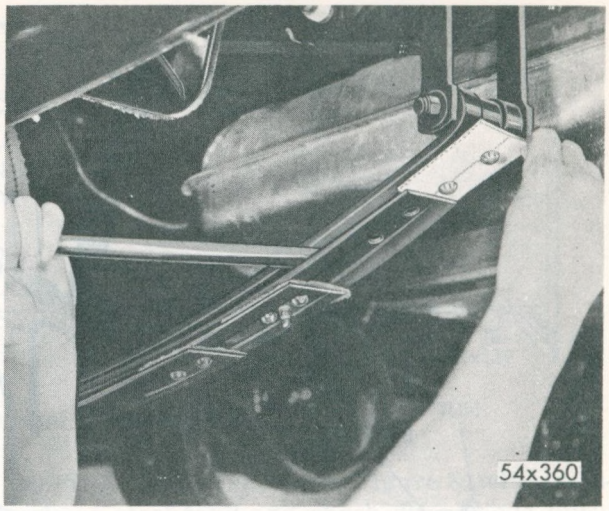

Fig. 9—Positioning New Interliners

CAUTION

Care should be taken when replacing rear spring on Imperial Models to see that the rear axle housing to frame struts are shimmed properly, so as to maintain correct propeller shaft to axle pinion shaft angle. (See Section XII).

5. REPLACEMENT OF REAR SPRING INTERLINERS

The 1957 Chrysler rear springs are similar to those previously used with exception of rear spring interliners. To replace interliners, proceed as follows: Examine spring interliners (Fig. 7). If any are missing, or if any have lost their metal fasteners, they must be replaced. For replacement of these interliners, proceed as outlined below.

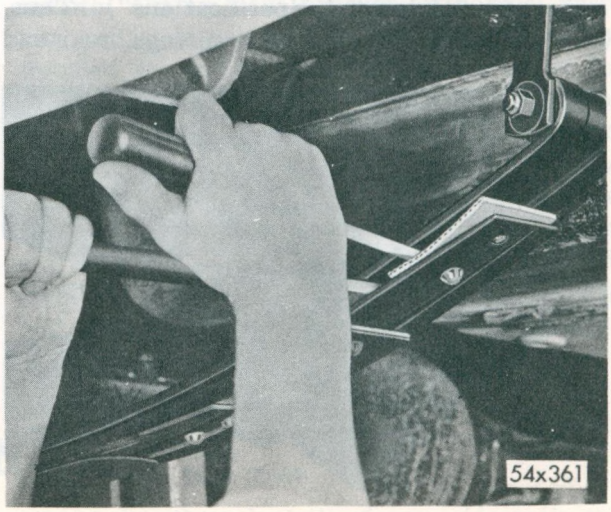

Fig. 10—Prying Interliner Fastener Through Leaf

a. Removal

Unload rear springs by jacking up the rear end of frame until rear shock absorbers are fully extended. Remove alignment clips from springs. If any of removed parts (nut, bolt, spacer, clip) are damaged, use corresponding replacement parts. Pry out metal fastener directly beneath spring leaf surface and slip out old interliner, after separating the spring leaf to which interliner was fastened from the next longer spring leaf. To effect this separation, pry open the slight gap between leaves with a screwdriver until a tapered bar can be hammered in place between screwdriver and interliner as shown in Figure 8. Keep tapered bar in place.

Clean the lower (grooved) surface of the longer spring leaf as far as interliner makes contact. Use sandpaper wrapped around a flat file and scrub vigorously to remove any dirt or rust spots to obtain smooth metallic surfaces to left and right of groove. Wipe off excess particles, including dirt in groove itself, with a clean cloth. In order to reach between leaves, open gap by bearing down on end of tapered bar.

b. Installation of Interliner

Refer to Fig. 9 and proceed as follows: Slip new interliner in place by opening gap between the spring leaves again with tapered bar and moving interliner until prongs of metal fasteners are aligned with holes in the shorter leaf, as shown in Figure 9. With tapered bar still in place, pry prong end of each metal fastener through hole in spring leaf.

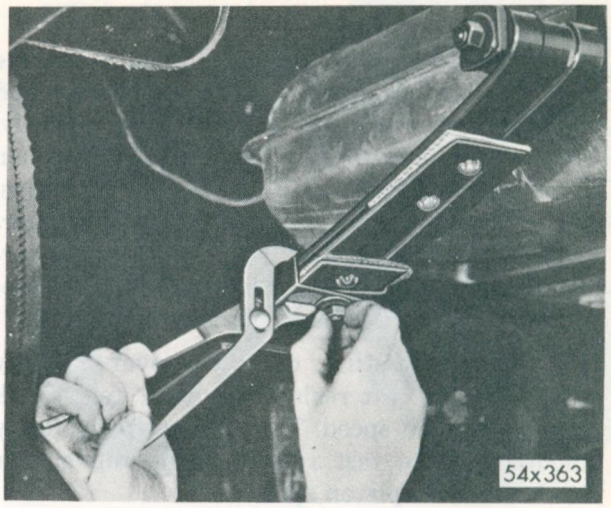

Fig. 11—Tightening Aligning Clip

Remove tapered bar which has remained between leaves during these operations. The bar may be withdrawn while a screwdriver is placed alongside. Then the screwdriver may be pulled out, reversing operation which was used to insert bar in position. A faster method for withdrawing bar is to insert end of a bar with a short tapered hook alongside the tapered bar. After tapered bar has been withdrawn, the bar with hook can be slipped out easily using leverage motion inward on the far end of hooked bar. Position wrap-around alignment clip and tighten retainer nut, as shown in Figures 10 and 11. Peen end of bolt over nut so it will not loosen.

SHOCK ABSORBER

Chrysler cars are equipped with double acting Oriflow shock absorbers. In the Oriflow shock absorber, resistance is built up slowly at beginning of stroke so as not to jolt passengers. This resistance is increased to a maximum at mid stroke and is tapered off to zero at end of movement. The major part of dampening is accomplished at high velocity mid-operation of stroke where no jolt can originate. There can be little jolt at beginning and at end of stroke because both velocities of movement and the resistance offered by the shock absorber are low at those points.

This simply means that the piston encounters minimum resistance at beginning of stroke and is gradually slowed down by increased resistance due to fluid velocity through the orifices. In turn, slow movement of piston causes fluid velocity to decrease and offer minimum resistance at termination of stroke.

To improve the riding qualities of the 1957 cars the valving of the front shock absorber has been revised to afford more control to spring action under varying road conditions.

6. TESTING ORIFLOW SHOCK ABSORBERS

Oriflow shock absorbers are designed to operate with low resistance when operated slowly and with high resistance when operated rapidly. Since they operate with little resistance when compressed by hand or by bench test methods, their true operating efficiency can only be determined by a road test. It is impossible to determine operating efficiency of Oriflow shock absorbers by rocking the car by the bumper.

When road testing, drive car over a fairly rough road to test resistance under fast shock absorber piston speed. Then drive over a fairly smooth road to test resistance during slower shock absorber piston speeds.

Hand testing Oriflow shock absorbers will only reveal complete failure. The amount of ride control evident from a hand test on bench is small, compared with control exerted under actual riding conditions. For this reason, it is impossible to feel any sudden resistance in an Oriflow shock absorber, no matter how fast it is operated by hand.

7. SERVICING THE ORIFLOW SHOCK ABSORBER

The Oriflow shock absorber cannot be refilled or disassembled. Where servicing is required, the shock must be removed and a new unit installed. **SHOCK ABSORBERS SHOULD ONLY BE REPLACED IF THEY HAVE LOST THEIR RESISTANCE IN ONE OR BOTH DIRECTIONS OR IF THEY DRIP OIL. EVIDENCE OF OIL MOISTURE IS NOT CAUSE TO REPLACE THEM AS SEAL MUST WEEP TO PREVENT SCORING.**

8. REMOVAL AND INSTALLATION OF FRONT SHOCK ABSORBER

a. Removal

Refer to Fig. 12 and proceed as follows: From the engine compartment remove dirt and grit from around shock absorber piston rod and upper retainer housing. Remove piston rod nut and retainer washer. Place jack in center of engine front crossmember and raise vehicle off floor. Remove shock absorber to lower control arm bracket attaching nut, bolt and washer. Disengage shock absorber eye from control arm bracket. Push lower portion of absorber up into frame housing sufficiently to clear lower bracket. Remove shock absorber.

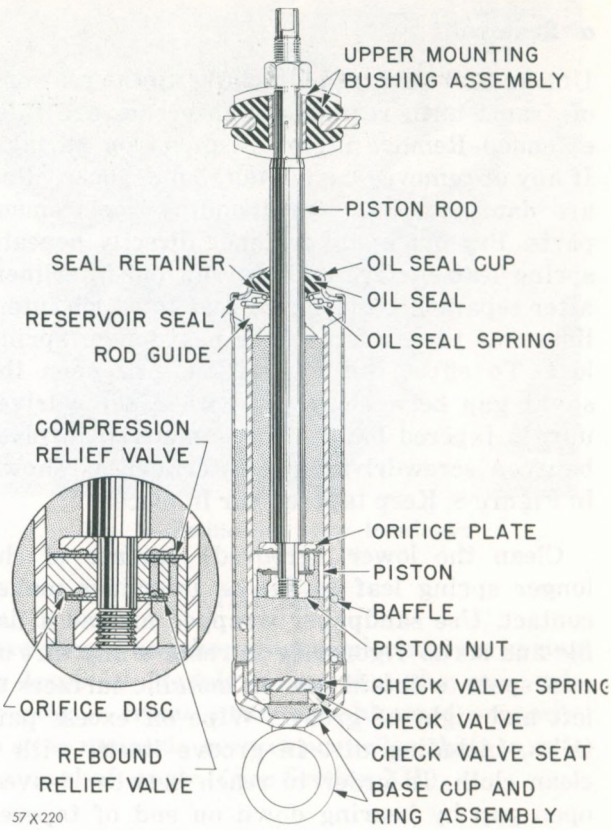

Fig. 12—Front Shock Absorber

NOTE: Care must be taken to see that the lower shock absorber mounting upper washer on the piston shaft is recovered from shock absorber housing when removing the shock absorber.

b. Installation

Place upper mounting retainer washer cupped side up, on shock absorber piston rod. Compress shock absorber piston rod into shock absorber. Insert assembly up through opening in frame to allow piston rod to enter upper housing bushing. While holding in position, install upper mounting retainer washer (cupped side down) and nut. Hold piston rod with suitable wrench and tighten nut to approximately 24 foot-pounds torque or until upper and lower mounting washer contacts steel spacer in bushing. Position lower end of shock absorber in lower control arm mounting bracket, install attaching bolt, nut and lockwasher, tighten to 40 foot-pounds torque.

9. REPLACING SHOCK ABSORBER PISTON SHAFT UPPER BUSHING

NOTE: The upper bushing should be checked

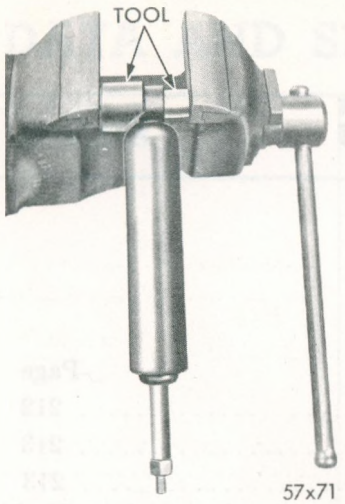

Fig. 13—Installing Shock Absorber Eye Bushing

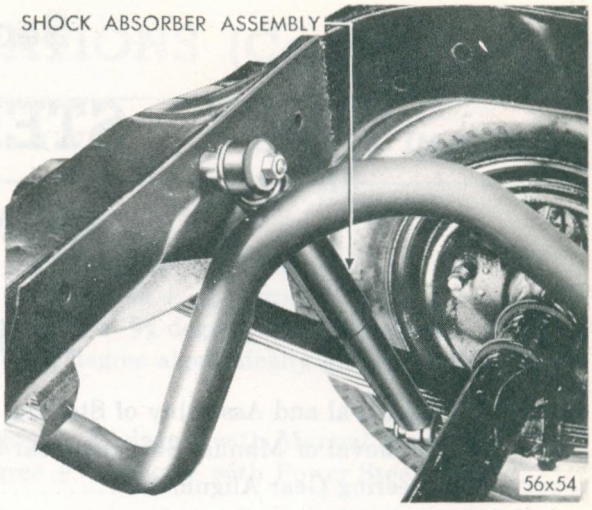

Fig. 14—Rear Shock Absorber Installed

whenever the shock absorber is removed from car.

a. Removal

If bushing is worn or damaged proceed as follows: Remove bushing inner steel spacer from bushing and with a suitable drift remove piston shaft bushing from frame housing.

b. Installation

Remove inner bushing spacer from replacement bushing. Immerse bushing in water (do not use brake fluid, soap or other alkaline fluids). Insert bushing in housing and with a twisting motion press bushing in place. Install bushing spacer.

10. REPLACING LOWER SHOCK ABSORBER EYE BUSHING

Remove the lower shock absorber bushing sleeve in vise or arbor press as shown in Figure 13.

NOTE: To avoid damaging bushings when installing bushings, press against the steel sleeve.

11. REMOVAL AND INSTALLATION OF REAR SHOCK ABSORBERS (FIG. 14)

To remove rear shock absorber, remove nuts from shock absorber mounting stud pins which pass through eyes at top and bottom of shock absorber, and remove shock absorber.

When installing a shock absorber, install bushings in the shock absorber's eye. Install inner bushing retainers, shock absorber and bushing assembly and outer retainers and nut. The concave face of each retainer must fit against convex face of adjacent bushing. Tighten to specified torque.

Section X

STEERING

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COAXIAL POWER STEERING

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DATA AND SPECIFICATIONS

MODELS	C-75-1	C-75-2	C-76	IM-1, 2 & 4
Steering Type				
Manual	Worm and Three Tooth Roller	None	None	None
Power	Rack and Gear Sector, Recirculating Ball Nut			
Ratio				
Manual	20.4	....	....	None
Power	16.3	16.3	16.3	16.3
Turning Radius (Curb to Curb)	45.4	45.4	....	49.5
Number Wheel Turns				
Manual	5.6	....	....	....
Power	3.5	3.5	3.5	3.5
Tread—Front	61.0	61.0	61.2	61.9
Rear	59.7	59.7	60.0	62.4
Wheel Base	126.0	126.0	126.0	129.0

DATA AND SPECIFICATIONS (Cont'd)

MODELS	C-75-1	C-75-2	C-76	IM-1, 2 & 4
Camber				
Left	+ ¼ degree ± ¼ degree			
Right	0 degree + ¼ degree			
	Preferred Left + ⅜ degree, Right 0 degree			
	Left ¼ degree to ½ degree algebraically greater than right			
*Caster				
Manual	— ¾ degree ± ¾ degree with Manual Steering			
Power	+ ¾ degree ± ¾ degree with Power Steering			
Toe-In (Outside Thread Inches)	3/32 to 5/32 in. (⅛ in. Preferred)			
Tow-Out on Turns	21 degrees 45 minutes ± 1 degree (inner wheel when outer wheel is 20 degrees)			
Steering Axis Inclination at Camber (Degree)	5 to 7 degrees at 0 degree			
Steering Knuckle Type	Ball and Socket			
Front Wheel Bearing Type	Tapered Roller Bearing			
Inner Bearing Size	1.25	1.25	1.25	1.375
Outer Bearing Size	.75	.75	.75	.844
Spindle Thread Size	¾—16 (NF)			
Steering Linkage Type	Symmetric Idler Arm (Equal Length Tie Rods)			

*Caster should be equalized as near as possible on Left and Right wheel.

COAXIAL POWER STEERING

MODELS	C-75, C-76, IM-1, 2 & 4
Fluid Capacity of Hydraulic System	2 qts.
Fluid Capacity of Worm Housing	14 Fluid ounces
Gear Housing	12 Fluid ounces
Type of Fluid	Automatic Transmission Fluid (Type A)
Pump Reservoir Capacity Including Hoses	28 Fluid ounces
Maximum Pump Pressure	750 to 900 psi.
Maximum Fluid Flow at 3,000 R.P.M.	2.25 gal.
Maximum Pump Rotor Clearances	.012

COAXIAL POWER STEERING (Cont'd)

MODELS	C-75, C-76, IM-1, 2 & 4
Flow Control Valve Spring	
Free Length	4.0 inches
Working Length	1.5 inches
Force at Working Length	12.5± 1.25 lbs.
Pressure Relief Valve Spring	
Free Length	.825 inch
Working Length	35/64 inch
Force at Working Length	12.5 to 14 lbs.

SPECIAL TOOLS

MANUAL STEERING

Tool Number	Tool Name
C-3402	Pitman Arm Puller
C-3428	Steering Wheel Puller

COAXIAL POWER STEERING

Tool Number	Tool Name
C-3128	Pliers—Snap Ring
C-3211	Hose—High Pressure
C-3229	Pliers—Gear Shaft Adjusting Screw Snap Ring
C-3309B	Gauge—Pressure Check
C-3318	Hose—Low Pressure
C-3319	Holding Nut—Worm Shaft Bearing
C-3320A	Nut Wrench—Worm Shaft

COAXIAL POWER STEERING (Cont'd)

C-3321	Holding Spanner—Worm Connector
C-3323	Fixture—Holding
C-3326	Nut Spanner—Worm Connector
C-3328	Nut Spanner—Upper Piston Rod
C-3329	Control Valve Spacer Seal-Installing Thimble
C-3331A	Driver and Pilot—Piston Rod Seal Installing
C-3332	Remover—Gear Shaft Bearing
C-3333	Driver—Gearshaft Bearing
C-3350	Remover and Installer—Gear Shaft Seal
C-3392	Wedge—Coupling Removing
C-3554	Protector—Lower Piston Rod Seal
C-3401	Thimble—Gear Shaft Adjusting Screw "O" Ring Installing
C-3402	Pitman Arm Puller
C-3428	Puller—Steering Wheel
C-3445	Rod—Control Valve Centering
C-3555	Flange—Oil Leak Testing

TIGHTENING REFERENCE

MANUAL STEERING

	Foot-Pounds
Steering Gear to Frame Bolt	50
Steering Gear Pitman Arm Nut	120
Steering Wheel Nut	40
Steering Knuckle Arm Bolt	50

MANUAL STEERING

	Foot-Pounds
Steering Linkage Ball Stud Nut	40
Idler Arm Bolt Bushing Nut	60
Tie Rod Clamp Bolt and Nut	150 In.-Pounds

COAXIAL POWER STEERING GEAR

	Thread Size	Foot-Pounds
Hose Fitting Nut	7/16 x 20	*3/8 to 5/8 Turn or 15
Hose Fitting Nut	5/8 x 18	*1/4 to 1/2 Turn or 30
Pump to Gear Housing	1/2 x 20	20
Reservoir to Pump Bolt	1/4 x 20	10
Steering Gear to Frame Bolt	7/16 x 20	50
Steering Gear Pitman Arm to Shaft Nut	.....	120
Steering Linkage Ball Stud Nut	.....	40
Steering Wheel to Steering Shaft Nut	.....	40
Tie Rod Clamp Bolt and Nut	.....	150 In.-Pounds
Pump Flow Control and Relief Valve Adapter (Retaining)	.....	50
Upper Piston Rod Nut	.....	30
Gear Shaft Cover Screws	.....	25
Worm Housing to Gear Housing Screws	.....	25
Gear Shaft Adjusting Screw Lock Nut	.....	30

*The number of turns specified in tightening tube fittings and hose fittings is after initial finger tightening.

RESERVOIR

	Thread Size	Foot-Pounds
Reservoir Cover Bolt	¼ x 20	10
Flow Spring Retainer Fitting	.....	20
Bearing Cap to Body	.....	25

PUMP

	Thread Size	Foot-Pounds
Pump Assembly Bolt	5/16 x 18	15
Hose Connector Outlet	⅝ x 18	30
Flow Divider Valve Plug	⅞ x 14	20

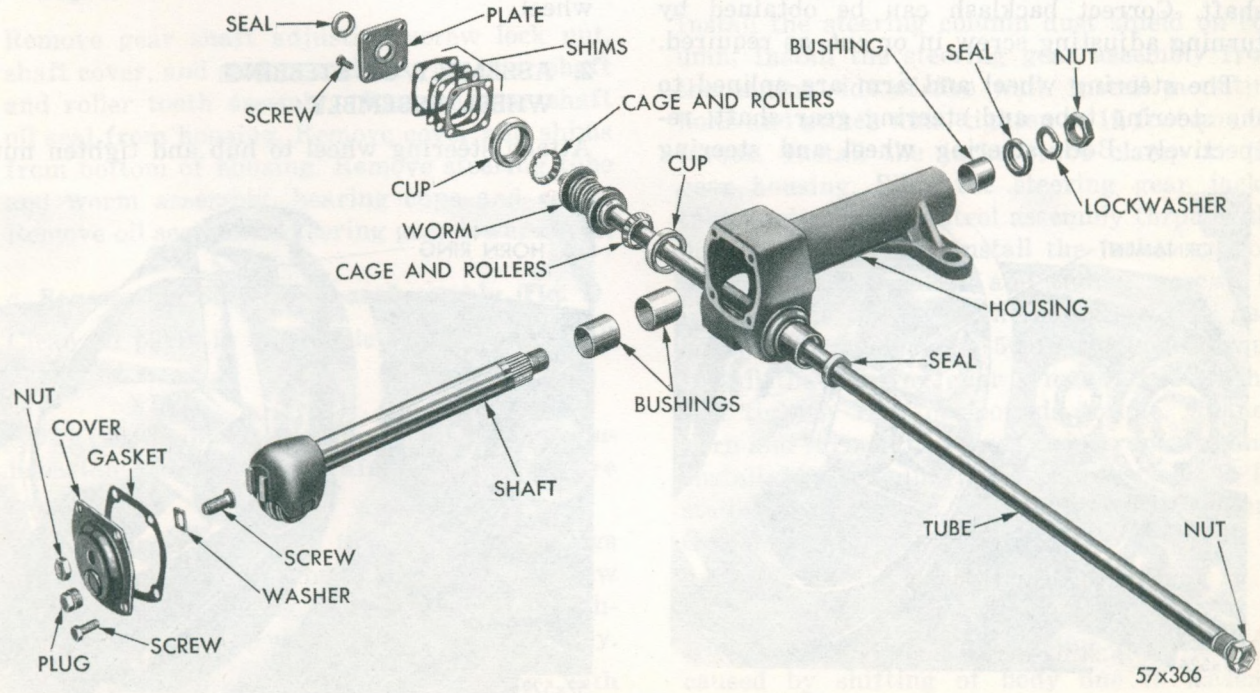

Fig. 1—Steering Gear Assembly (Disassembled View)

Section X
STEERING
MANUAL

A modified three-tooth roller and worm steering gear assembly (Fig. 1) is used in the Chrysler 1957 cars, equipped with manual transmissions. The steering gear is mounted inboard of the frame and can be serviced without removal from car.

The worm is integral with the steering tube and is supported at each end by tapered roller bearings. The worm bearing preload is adjusted by means of shims placed between housing and housing end cover. The steering gear shaft rotates in two bronze bushings pressed into the steering gear housing. The three-tooth roller on shaft is meshed with worm. When the steering wheel is turned, the worm rotates the steering gear shaft and roller, moving the steering gear arm, which is splined to end of shaft and held in place with a nut.

Backlash between steering gear shaft roller tooth and worm is controlled by an adjusting screw that is threaded through shaft and roller cover. The base end of adjusting screw is engaged in a slot in end of the steering gear shaft. Correct backlash can be obtained by turning adjusting screw in or out, as required.

The steering wheel and arm are splined to the steering tube and steering gear shaft, respectively. Both steering wheel and steering gear arm have master serrations to insure correct installation.

The high point is the point of least clearance between the worm and roller and is at midpoint of worm and roller travel.

NOTE: Proper steering gear adjustments influence the performance of the steering gear assembly. Care should be taken to accomplish proper shaft and worm high point setting since this adjustment limits the turning circle on each side of center.

1. REMOVAL OF STEERING WHEEL ASSEMBLY

Disconnect battery. Turn ornament counterclockwise and remove (Fig. 2). Disconnect wire from terminal, remove three screws, three bushings and remove horn ring (Fig. 3). Remove horn blowing contact ring switch from steering wheel hub. Loosen steering wheel nut three full turns and attach steering wheel puller Tool C-3428 and remove nut and steering wheel.

2. ASSEMBLY OF STEERING WHEEL ASSEMBLY

Attach steering wheel to hub and tighten nut.

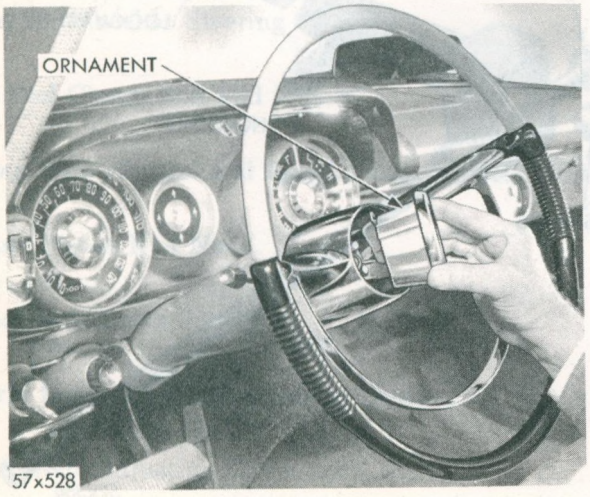

Fig. 2—Removing or Installing Steering Wheel Ornament

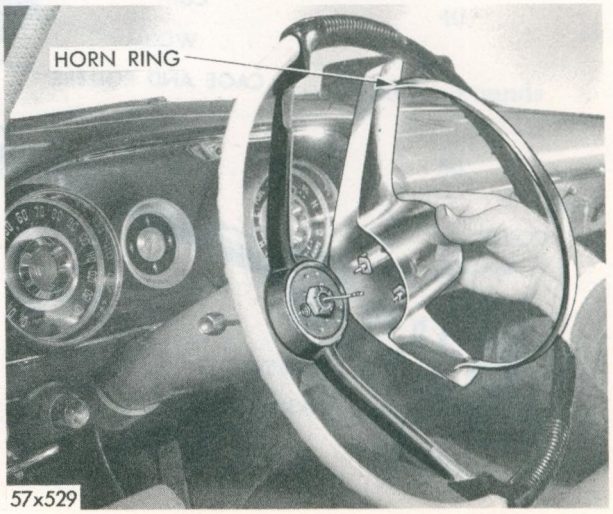

Fig. 3—Removing or Installing Steering Wheel Horn Ring

Install contact ring switch, connect wire to terminal. Install horn ring and tighten three screws. Turn ornament clockwise in hub. Reinstall battery cable.

3. REMOVAL OF MANUAL STEERING GEAR ASSEMBLY (Figs. 1, 2 and 3)

a. Removal (From Vehicle)

NOTE: It is not necessary to remove the steering column and mast assembly from car to service gear lower worm bearings and cross shaft assembly.

Disconnect the battery ground cable. Remove the steering wheel and disconnect the horn and turn signal wires at the instrument panel. Remove jacket tube clamp at the steering gear housing. Remove the steering jacket support clamp at the instrument panel. Remove the dust shield at the firewall. Remove the floor opening panel. Remove the steering gear arm with Tool C-3402. Remove the steering gear housing to frame bolts. Slide the steering gear jacket tube and remove control units rearward, through the drivers compartment as an assembly. Remove the brake pedal pad and remove gear from engine compartment side of firewall.

b. Disassembly Steering Gear Assembly (Fig. 1)

Remove gear shaft adjusting screw lock nut, shaft cover, and gasket, and steering gear shaft and roller tooth assembly. Remove gear shaft oil seal from housing. Remove cover and shims from bottom of housing. Remove steering tube and worm assembly, bearing cups and cages. Remove oil seal from steering gear lower cover.

c. Reassemble Steering Gear Assembly (Fig. 1)

Clean all parts in a suitable solvent. Check all parts for wear.

NOTE: Assemble parts without lubrication. Lubrication should be done after adjustments are completed.

If either of the worm thrust roller bearings are damaged, replace both bearings. Use new oil seals. The steering gear housing and bushing assembly is serviced only as an assembly.

Insert worm and tube into housing with bearings and cups. Install shims and lower housing cover, making sure bearings are seated. When tightening cover, turn worm tube to be sure no bind exists. Final tightening of cover screws cause end play to disappear with torque of 3/8 to 3/4 pound required to rotate the tube, when measured with the pull applied at rim of steering wheel. Add or remove shims in event a bind or excessive end play occurs. Shims are available in .003, .006, .011 and .025 inch.

Install gear shaft. Before installing cover, turn adjusting screw all the way out. Place steering wheel on tube and rotate steering wheel in one direction to the end of its travel. Rotate wheel in other direction to the end of its travel, counting the turns. Rotate wheel back 1/2 full number of turns. This is center of travel (high point). Turn adjusting screw (clockwise) until all end play in roller shaft is gone. Rotate wheel to one end of its travel and apply a spring scale or torque wrench. With pull applied at rim of steering wheel, tension should measure from 1 to 2 pounds. The greatest tension should be felt as the wheel is rotated past the center position (high point).

Adjust bearing load by turning adjusting screw in or out. Install lock plate nut and steering gear arm. Fill gear housing with SAE 90 Gear Lubricant and check for leaks.

d. Installation (In Vehicle)

Install the steering column dust shield on column. Install the steering gear assembly from the engine side of fire wall. Install mounting bolts and attach nuts, tighten to 15 foot-pounds torque. Install the jacket tube clamp at the gear housing. Slide the steering gear jacket tube, and remove control assembly through the floor panel opening. Install the jacket support to dash bracket, align and tighten screws 50 inch-pounds torque. Tighten the steering gear housing to frame bolts 50 foot-pounds torque. Install the steering gear arm nut and washer and tighten 120 foot-pounds torque. Connect horn and turn signal wires at instrument panel. Install floor opening panel and dust shield. Install steering wheel, horn ring and ornament. Connect battery.

4. STEERING GEAR ALIGNMENT

A slight bind of the steering gear may be caused by shifting of body due to loosened bolts. Tighten body bolts. Loosen the steering gear at frame, and dash bracket to allow the

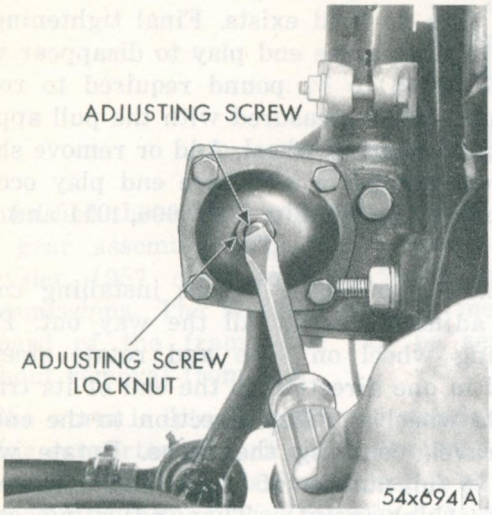

Fig. 4—Steering Gear Adjustments

steering gear to move in relation to the frame. Tighten mounting bolts 50 foot-pounds torque.

Position the center of steering column in center of the instrument panel. If this cannot be done by moving the frame bracket, add metal washer shims between frame and frame bracket to eliminate all bind.

5. ADJUSTMENT (In Car) (Fig. 4)

a. Adjusting Steering Tube Worm Bearings

Remove steering gear arm, drain the housing and disconnect horn wire at connector. Remove grease retainer cover at bottom of steering gear housing and remove necessary shims to eliminate excessive end play. Add shims of necessary thickness, to eliminate a binding condition. If any tightness exists, too many shims have been removed or the steering assembly is out of alignment. See "Steering Gear Alignment," Paragraph 3.

b. Adjustments of Roller Tooth and Worm (In Car)

Disconnect steering gear arm at link. Rotate steering wheel to mid-position and check for backlash by attempting to move steering gear arm back and forth. If backlash exists, remove roller shaft adjustment screw locknut and tighten adjusting screw enough to eliminate free play. Be sure the roller shaft and worm do not bind. Check backlash again. Install adjusting screw locknut and steering gear arm.

6. SERVICING THE IDLER ARM (Fig. 5)

The idler arm and bushing is serviced as an

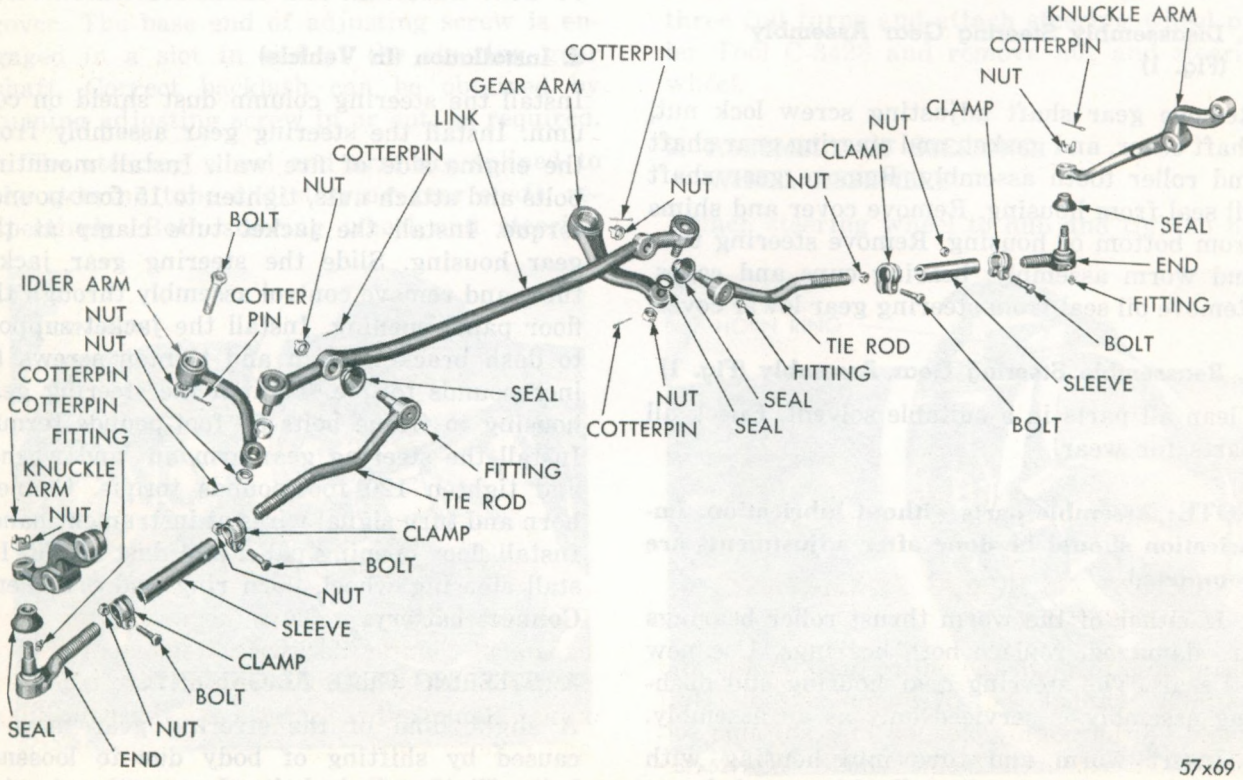

Fig. 5—Steering Gear Linkage

assembly. With wheels in straight-ahead position check opening of idler arm bracket (should be 2¼ inches). Install idler arm assembly. Apply lubriplate to support bolt. Tighten nut to 60 foot-pounds torque and install cotter pin.

7. STEERING KNUCKLE TIE RODS (Fig. 5)

a. Removal

NOTE: Tie rod end and bolt is serviced only as an assembly.

Loosen nut on rod ball and remove tie rod end with Tool C-3394. Insert leg of tool between the steering linkage knuckle arm and tie rod end. Turn puller screw against tie rod end nut, forcing tie rod end from the knuckle arm. Remove tie rod from center link by placing leg of puller between center link and tie rod end. Remove tie rod end assembly from tie rod by loosening clamps and unscrewing the rod end assembly.

b. Installation

NOTE: The clamping bolts must be beneath tie rods to prevent interference on turns. Check and adjust toe-in when new tie rods are installed.

When installing tie rod ends to the rod tube, be sure to thread the ends evenly on tube body to nominal length to obtain proper positioning of steering wheel.

8. ADJUSTMENT OF FRONT WHEEL BEARINGS

(Refer to Front Wheel Suspension, Section I)

Tighten the wheel bearing adjusting nut with an inch-pound torque wrench 90 inch-pounds while rotating the wheel. Position the nut lock, over the adjusting nut so the spindle cotter pin hole is in line with one set of the slots in the nut lock. Without removing the nut lock, back off the nut until the next set of slots are lined up with the spindle cotter pin hole. Insert and bend the cotter pin to secure the nut lock.

NOTE: This procedure should result in from .000 inch (no preload) to .003 inch bearing free play measured axially. It is important to remove any burrs or nicks on the spindle thread to insure accurate readings.

COAXIAL POWER STEERING

The new 1957 Chrysler Coaxial Power Steering Unit (Fig. 6) incorporates two basic gear mechanisms, a worm and worm connector, and rack and sector gear.

The hydraulic system of power steering gear consists of a double-acting piston, a valve (which fits inside the piston), and hydraulic reaction chamber (which gives driver "feel" of road). Axial positioning of valve directs high pressure oil to one side or the other of double-acting piston.

Other components of hydraulic system are the oil pump with pressure relief and flow control valve filter and oil reservoir.

9. PRECAUTIONS DURING DISASSEMBLY AND ASSEMBLY

Cleanliness through the entire disassembly and assembly cannot be over-emphasized. Unit should be thoroughly cleaned in a suitable solvent when removed from vehicle. When disassembling, each part should be placed in solvent, washed, and dried by compressed air. Crocus cloth may be used to remove small nicks or burrs provided it is used carefully. When used on valve spool, use extreme care not to round off sharp edge portion. The sharp edge portion is vitally important to this type of valve, it helps to prevent dirt and foreign matter from getting between the valve and bore, thus reducing the possibilities of sticking.

Remove and discard all "O" seal rings, and seals, using new ones lubricated with Lubriplate when reassembling.

10. REMOVAL OF STEERING WHEEL AND POWER STEERING GEAR COLUMN JACKET (MODELS C-75, C-76)

Disconnect battery. Turn horn blowing ring ornament counter-clockwise. Remove ornament from steering wheel. Disconnect wire from terminal. Remove three screws and three bushings and remove horn ring.

Remove horn blowing contact ring switch

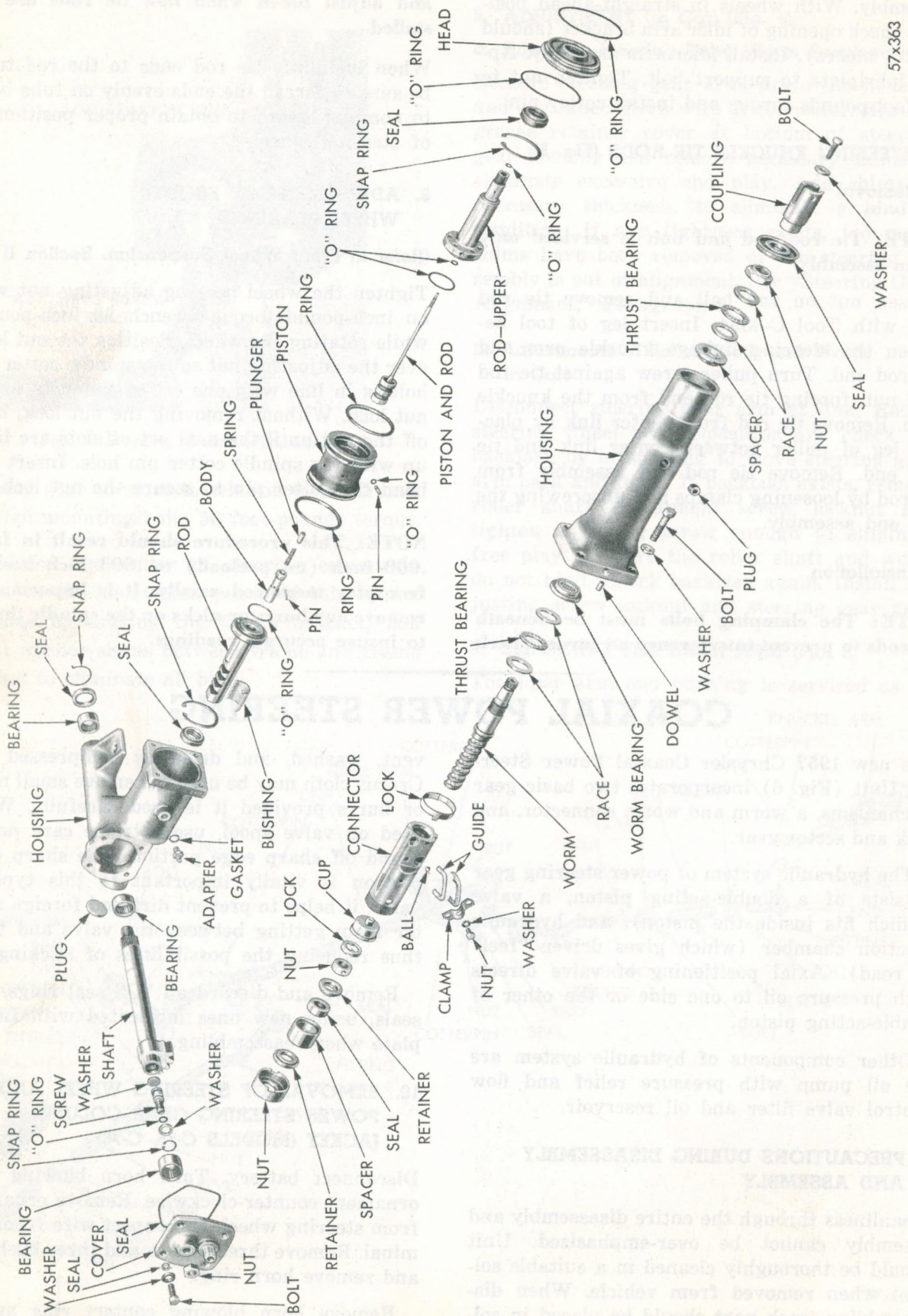

Fig. 6—Coaxial Power Steering Unit (Exploded View)

from steering wheel hub. Loosen steering wheel nut 3 full turns and attach puller Tool C-3428. Remove steering wheel from serrations, and remove tool, nut, steering wheel. Remove screw and washer from under side of heat shield. Remove shield.

Remove two screws and bracket clamp securing steering column jacket at instrument panel. Disconnect direction indicator wires and horn wire at connectors below instrument panel. Loosen two screws and nuts at steering gear housing jacket at lower clamp. Remove column jacket, by carefully turning assembly clockwise and pulling upward.

11. INSTALLATION OF STEERING WHEEL AND POWER STEERING GEAR COLUMN JACKET (MODELS C-75, C-76)

Install column jacket over steering column tube and position jacket over the power steering gear housing. Be sure rubber sleeve is in position before installing steering post bracket clamp on instrument panel. Do not tighten clamp bolts at this time. Connect direction indicator wires and horn wire at connectors, and install junction block into retaining clip below instrument panel. With front wheels in straight-ahead position, install steering wheel and steering wheel nut. Tighten nut 40 foot-pounds torque.

NOTE: Check to make certain that cancelling dogs on steering wheel actuate the directional switch. Move column jacket up or down to obtain proper steering wheel to column jacket clearances and for proper operation of directional switch.

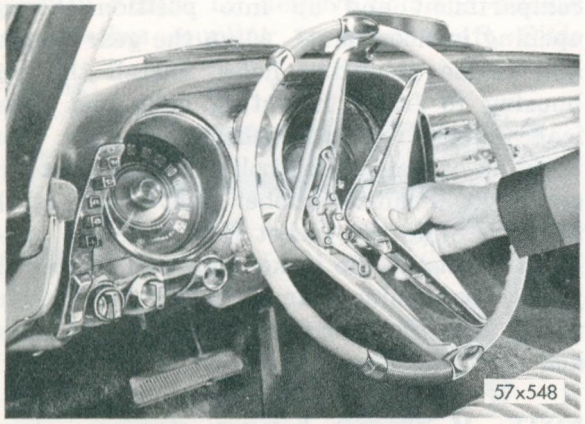

Fig. 7—Removing or Installing Steering Wheel Horn Ring

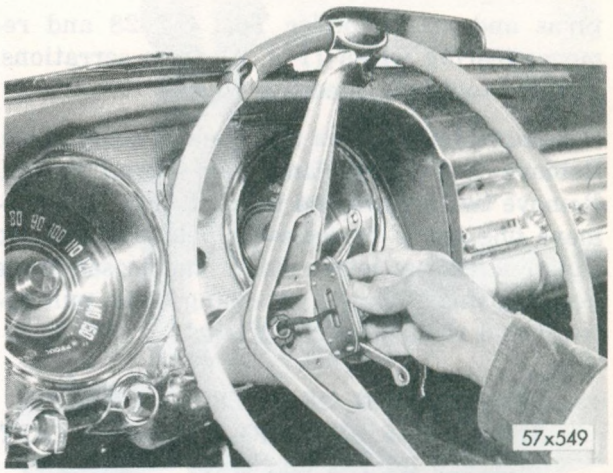

Fig. 8—Removing or Installing Ground Plate

With steering wheel positioned, tighten clamp bolts at power steering housing and screws at instrument panel bracket clamp. Install heat shields. Install horn blowing contact ring switch on steering wheel hub. Install horn ring. Connect horn wire and install ornament. Connect battery.

12. REMOVAL OF STEERING WHEEL AND POWER STEERING GEAR COLUMN JACKET (MODELS IM 1, 2 and 4)

Remove two screws and washers from underside of steering wheel spokes. Remove horn ring and cushion assembly (Fig. 7). Disconnect horn wire. Remove four screws and bushings and remove horn blowing ring retainer and horn switch. Remove four screws and washers and remove ground plate (Fig. 8) from steering wheel. Loosen steering wheel nut three full

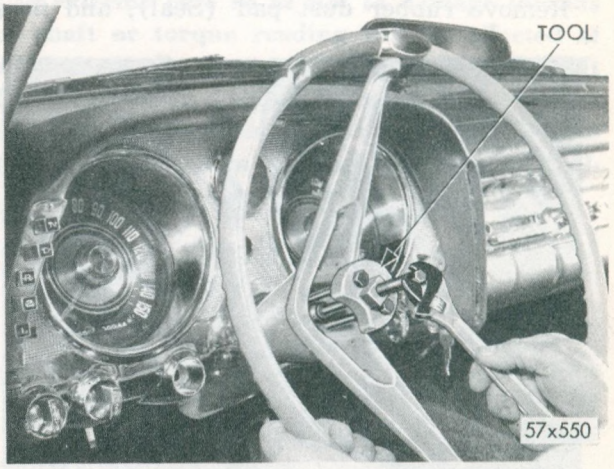

Fig. 9—Removing or Installing Steering Wheel Using Tool C-3428

turns and attach puller Tool C-3428 and remove steering wheel (Fig. 9) from serrations. Remove tool, nut, steering wheel.

Remove four screws and remove cover plate. Remove two screws and turn signal switch. Remove two screws and bracket (Fig. 10). Remove one screw to remove shield. Loosen two clamp screws at lower clamp and loosen three gear housing to frame attaching bolts, pull upward and remove column jacket.

13. INSTALLATION OF STEERING WHEEL AND POWER STEERING COLUMN JACKET (MODELS IM 1, 2 and 4)

Install column jacket over steering column tube and position jacket over power steering housing and tighten two clamp screws at lower clamp. Tighten three gear housing to frame attaching bolts. Install shield. Install two screws and bracket. Install turn signal switch (Fig. 11). Install 4 screws and cover plate.

With front wheels in straight ahead position, install steering wheel and nut. Tighten nut 40 foot-pounds torque. Install ground plate, horn switch, horn blowing ring retainer. Connect hornwire, and install horn ring and cushion assembly.

14. REMOVAL OF POWER STEERING UNIT

Remove steering wheel and power steering column jacket. Refer to Paragraphs 10 and 12. Remove pin and disconnect steering tube from coupling. Remove floor mat retaining plate—(Heat Shield Support).

Remove rubber dust pad (Seal), and floor

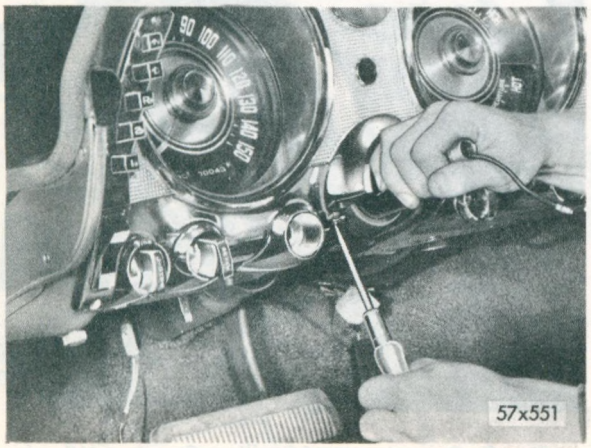

Fig. 10—Removing Turn Signal Switch and Bracket

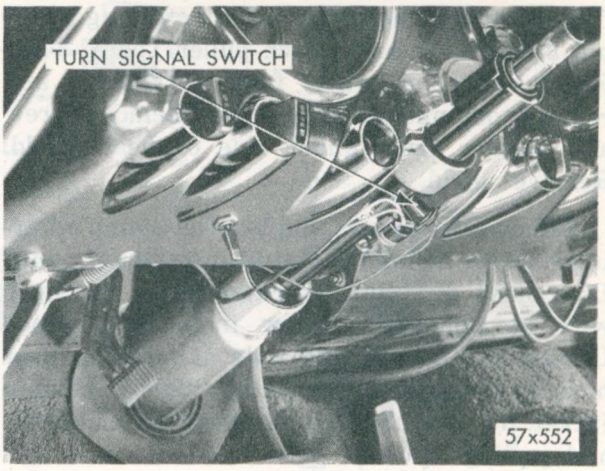

Fig. 11—Installing Turn Signal Switch

panel. (Opening Cover). Disengage drag link from steering gear arm and pull steering gear arm with Tool C-3402.

Loosen three gear housing to frame attaching bolts. Disconnect pressure and return hoses. Cap fittings at steering gear and fasten disconnected ends of hoses above oil level in reservoir to prevent further oil loss. Cap ends to prevent any foreign matter from entering. Disconnect stop lite switch wires from brake master cylinder. Disconnect brake booster reservoir from fender side shield and move aside. Remove gear housing to frame attaching bolts and alignment wedge. Remove gear assembly by sliding unit forward and out of engine compartment, as shown in Figure 12.

15. INSTALLATION OF POWER STEERING UNIT

Enter steering gear assembly through engine compartment and up into position through opening in floor panel. Align the gear housing and frame mounting holes. Install the gear housing to frame mounting bolts and spherical washers (two washers on each front bolt and one on wedge bolt). Tighten nuts finger tight. Position rubber dust shield at the firewall. Slide the jacket tube over the upper housing. Install the jacket tube and tighten the jacket to housing clamp. Install the steering wheel, horn ring, ornament and connect horn and direction signal wires.

NOTE: If distance between steering column jacket and steering wheel is less than ⅛ inch, adjust column jacket.

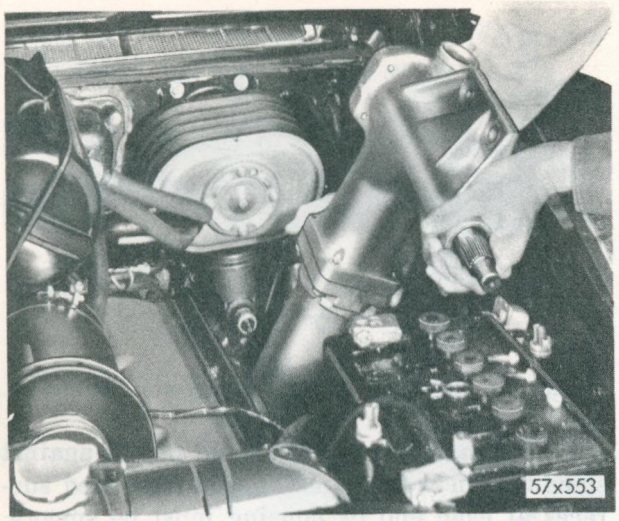

Fig. 12—Removing or Installing Power Steering Gear Assembly

Install and tighten the jacket to dash panel support bracket. Install the heat shield. Tighten the front upper and lower gear housing to frame bolts 20 foot-pounds torque. Install wedge at rear bolt, tapping it lightly in place. Tighten the mounting bolts 50 foot-pounds torque. Install the steering gear arm and tighten nut 120 foot-pounds torque. Connect the pressure and return hoses. Refill the reservoir and gear housing. Connect battery.

16. REMOVAL OF WORM HOUSING FROM GEAR HOUSING (Fig. 6)

Drain lower portion of steering gear through the pressure and return connections, by turning steering tube coupling from one extreme of travel to the other. Drain the upper housing. Bolt holding fixture, Tool C-3323 to power steering unit and mount fixture in vise, as shown in Figure 13. Remove bolt and washer that attaches coupling to worm shaft. Slide

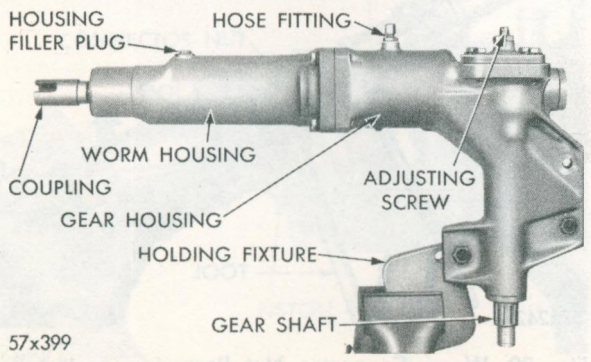

Fig. 13—Steering Unit Mounted in Holding Fixture

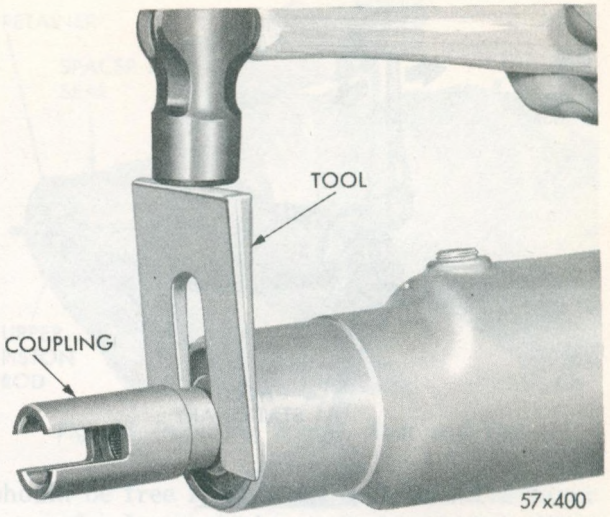

Fig. 14—Removing Coupling

Tool C-3392 down between housing and coupling, rap sharply with hammer, forcing coupling off end of the shaft, as shown in Figure 14.

Insert a screw driver under lip of worm housing oil seal, gently pry seal out away from housing and slide off end of worm shaft. Using a thin blade screw driver, pry locking collar portion of bearing adjusting nut out of keyway in worm shaft. Slide Tool C-3320A over worm shaft and down over nut. Position Tool C-3319 over shaft end and engage serrations, as shown in Figure 15. Holding worm shaft stationary, loosen bearing adjusting nut, as shown in Figure 16. Remove tools, and remove adjusting nut. Discard adjusting nut, using a new nut at reassembly.

CAUTION

Use extreme care so as not to damage threads of shaft or torque reading will be affected at adjustment. Be sure new nut threads on shaft freely. To make a thread chaser nut of the new one, use 3 cornered file and relieve threads (beyond bottom) in 1/32 inch deep in 4 equal-

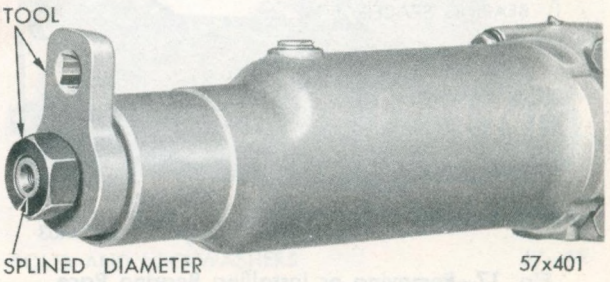

Fig. 15—Tools for Removing or Installing Adjusting Nut

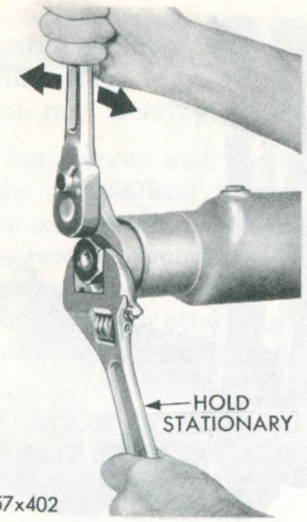

Fig. 16—Removing or Installing Adjusting Nut

ly spaced positions. Then thread nut on shaft to clear threads. Remove and clean nut several times during operation.

Slide the outer bearing race, thrust bearing inner race and spacer out of housing, as shown in Figure 17. Remove bolts and washers that attach worm housing to gear housing. Slide worm housing up and away from gear housing, exposing the worm connector, as shown in Figure 18. Lightly tap worm housing to overcome the interference fit of "O" seal rings, between worm housing and housing head. Remove "O" seal rings from head and discard.

Remove the bearing races, thrust bearing and spacer (with needle bearings) from the worm housing. **The spacer and needle bearing assembly are serviced as an assembly only.** The bearing races should be smooth, without pits or scratches, and the wear pattern should be uniform around the race. The rollers of bearings should be smooth, highly polished and free to turn in their retainers. The needle bearing rollers in lower spacer should also be free to

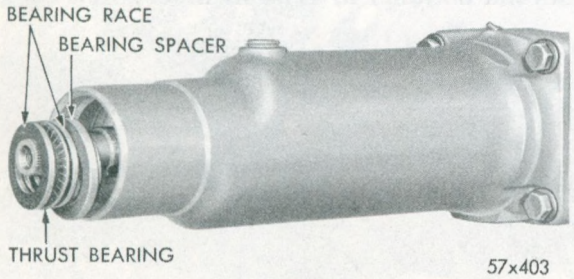

Fig. 17—Removing or Installing Bearing Race, Bearing and Spacer

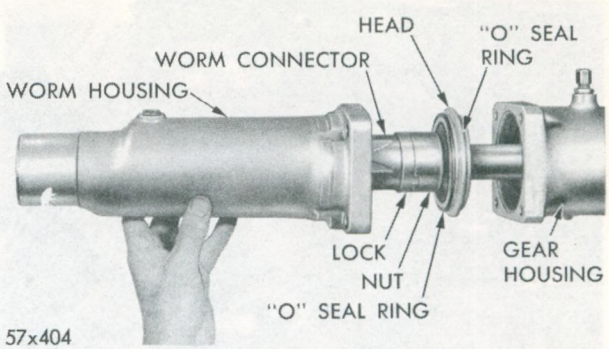

Fig. 18—Removing or Installing Worm Housing

roll in cage. The spacers should fit flat against shoulders in worm housing and machined surfaces at each end of housing must be smooth, without nicks or burrs. Replace all parts that show signs of wear.

17. REMOVING WORM CONNECTOR AND VALVE CONTROL (Fig. 19)

Pry worm connector nut lock from openings in connector, slide lock up on connector far enough to clear unit. Slide Tool C-3321 over rails of connector, as shown in Figure 20. Ro-

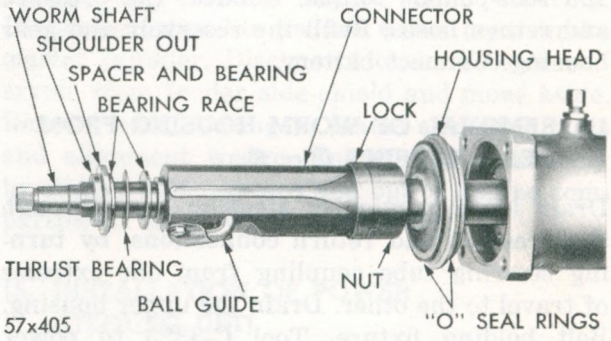

Fig. 19—Worm Connector Assembly

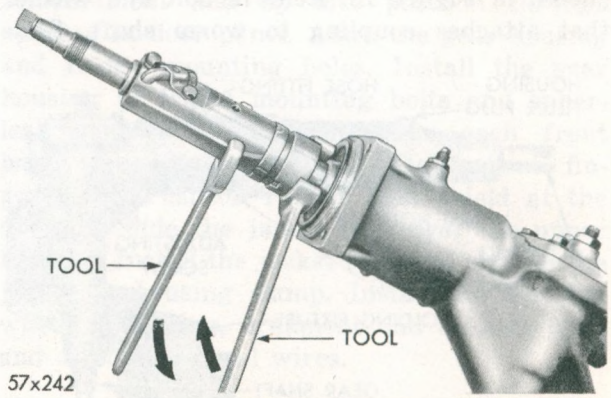

Fig. 20—Worm Connector Nut Removing or Installing Tools C-3321 and C-3326

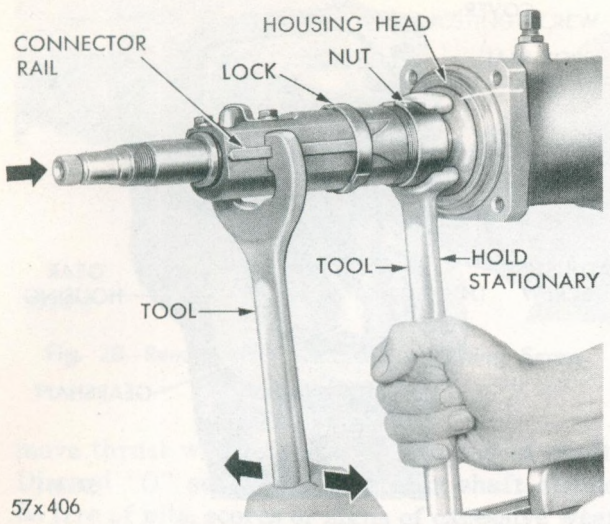

Fig. 21—Removing or Installing Worm Connector Nut

tate steering gear shaft and raise connector far enough to install Tool C-3326. Move connector down to hold tool against housing head to keep tool from slipping out of nut. Remove worm connector nut, as shown in Figure 21. Slide worm connector assembly from upper piston rod. Remove the valve adjusting cup from inside of worm connector.

Pry retaining portion of piston rod nut lock from the indents in the nut. Remove the lock. **(Use care when removing lock so as not to damage the control spacer).** Install Tool C-3328 in indents in nut, remove nut, as shown in Figure 22. Slide spacer, seal assembly and nut from valve rod, as shown in Figure 23. Slide housing head off end of valve rod.

The piston rod nut must be smooth on both ends. The nylon insert nut must be tight in the valve adjusting cup. The flange inside connector nut should be smooth and housing head

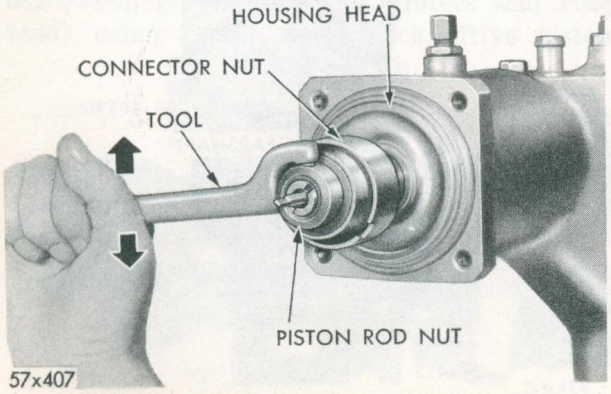

Fig. 22—Removing or Installing Piston Rod Nut

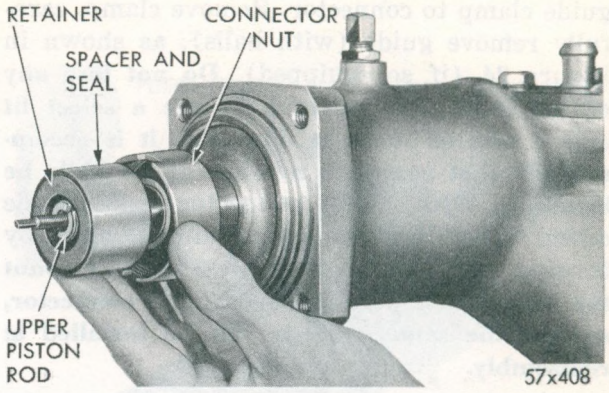

Fig. 23—Removing Spacer, Seal and Nut

should be free from nicks or burrs. The inner bore of valve control spacer should show little or no wear from the retainers, and edges should be smooth; free from nicks or burrs. If nicks or burrs are present, remove with crocus cloth spread over a flat surface.

The valve control spacer is serviced in two different lengths, with a .001 inch differential. The spacer must be exactly the same length as space between piston rod nut and shoulder of piston rod. With nut tightened, spacer should roll freely in groove, barely holding its own weight.

18. DISASSEMBLING THE WORM CONNECTOR

NOTE: When disassembling the worm connector, care should be taken so as not to bottom the worm shaft in either direction. Bottoming the worm shaft may damage the ball guides, which will cause either a tight or rough operating worm.

Remove bolts and lock washers that attach ball

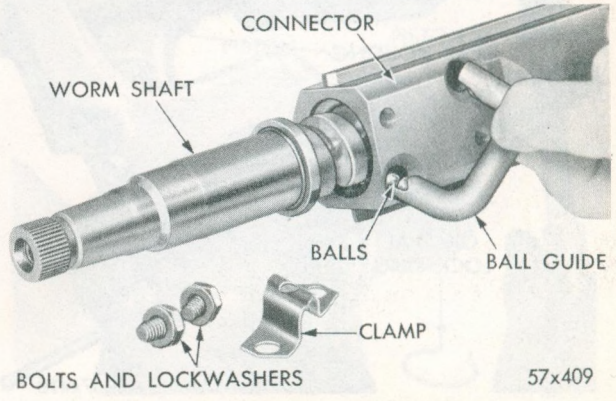

Fig. 24—Removing or Installing the Ball Guide

guide clamp to connector. Remove clamp, carefully remove guide (with balls), as shown in Figure 24 (if so equipped). **Do not lose any of the balls. The worm balls are a select fit and if one or more is damaged, it is recommended that complete new set of 40 balls be installed.** With worm connector held upside down, carefully remove remaining balls by turning worm in and out. **Be sure and count the balls which were removed from connector, so that the same number will be installed at reassembly.**

Slide worm out of connector, remove the nut lock by sliding off connector. The guide rails on connector should be free of nicks or burrs and slide freely on guides in housing. The ball track on the worm should be smooth, without pitting or roughness. The balls should show no signs of brinelling, pitting or flaking. Check the fit of adjusting cup and spacer in connector; if loose, install new spacer; adjusting cup, or both.

19. DISASSEMBLY OF GEAR HOUSING

Remove lock nut from gearshaft adjusting screw. Remove gearshaft oil seal snap ring, using pliers. Slide threaded portion of Tool C-3350 over end of gear shaft and down against seal. Install nut on threaded portion of shaft. Turn complete tool until the tool has entered seal. Install half collars and retainer to lock tool together. Back off on nut and pull seal out of housing, as shown in Figure 25. Remove tool. Remove bolts and washers that attach gearshaft adjusting cover to housing. (Two bolts have sealing washers. The bolt holes are tapped through to inside of housing). Discard sealing washers.

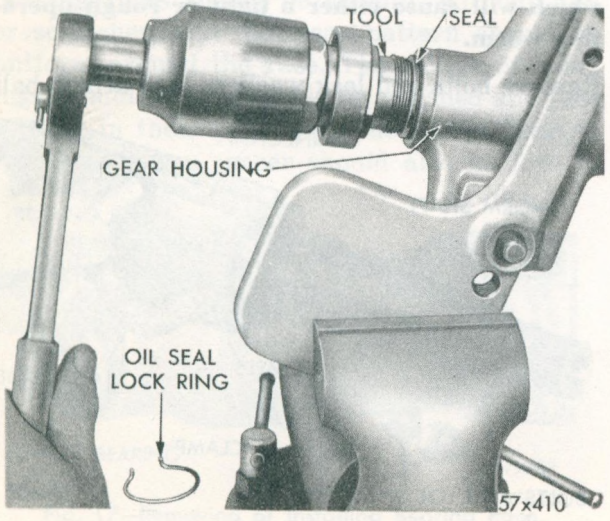

Fig. 25—Removing the Gearshaft Oil Seal

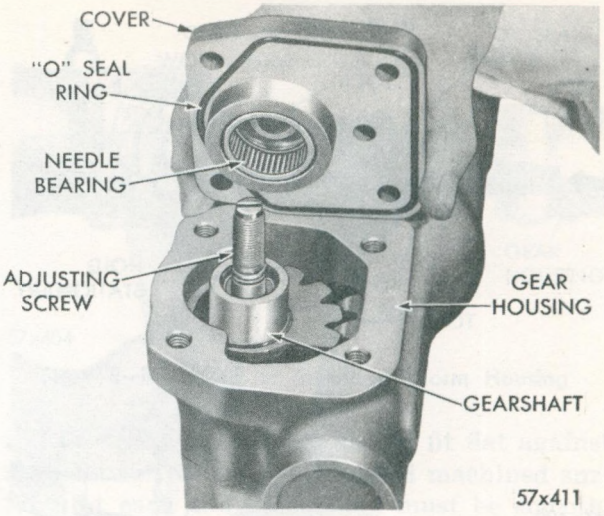

Fig. 26—Gearshaft Cover Removed

To remove the gearshaft cover, turn the adjusting screw into cover, using a screw driver until flush. Spin cover off adjusting screw and remove from housing, as shown in Figure 26. Remove and discard the cover "O" seal ring. Align gear on gearshaft to clear opening in housing, and using a fibre hammer, rap lightly on end of gearshaft. Slide gear and shaft out of housing, as shown in Figure 27.

Using pliers Tool C-3229, remove adjusting screw retaining snap ring, as shown in Figure 28. Slide adjusting screw, "O" seal ring and retaining washer from end of gearshaft. Re-

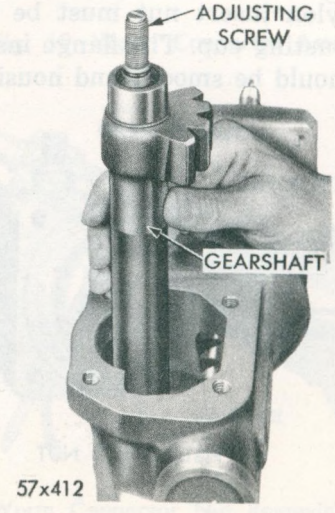

Fig. 27—Removing the Gearshaft

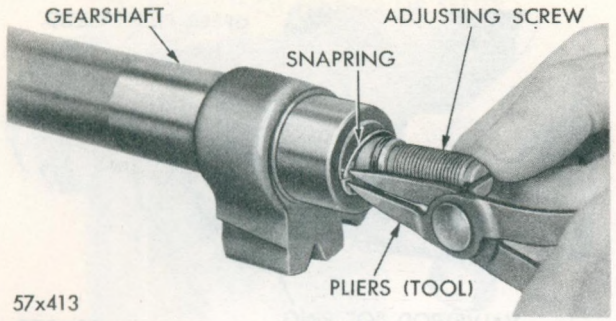

Fig. 28—Removing or Installing Adjusting Screw Snap Ring

move thrust washer from seat in end of shaft. Discard "O" seal ring. The gear shaft should be free of pits, scores or signs of excessive wear in seal and bearing contact areas. The gear teeth should be smooth and show a good contact pattern. The needle bearings in cover should be smooth and rotate freely in the race.

20. DISASSEMBLY OF PISTON AND RODS

Place a suitable container under gear housing to catch the trapped oil, remove piston assembly and rods from housing and disassemble as follows: Grasp upper piston rod firmly, twist slightly and pull piston and lower rod straight out of housing, as shown in Figure 29. **Do not permit lower piston rod to touch piston bore to prevent gouging.** Remove snap ring that holds lower rod in piston, using snap ring pliers, Tool C-3106, as shown in Figure 30. Carefully work the lower rod out of piston, to expose piston valve, as shown in Figure 31. Remove and discard the rod "O" seal ring.

Slide piston valve out of piston, as shown in Figure 32. **Use care so as not to bend the valve rod during or after removal.** Support piston assembly (in order to protect seal ring land) using a soft wood block, drive piston

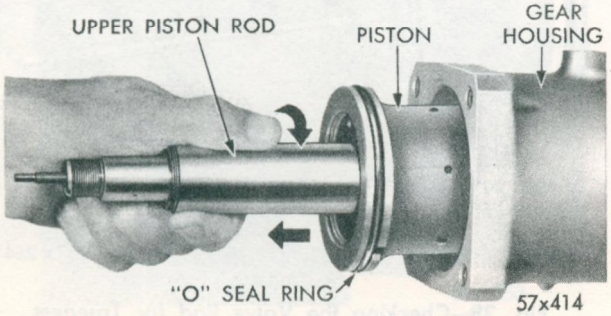

Fig. 29—Removing the Piston and Rod Assembly

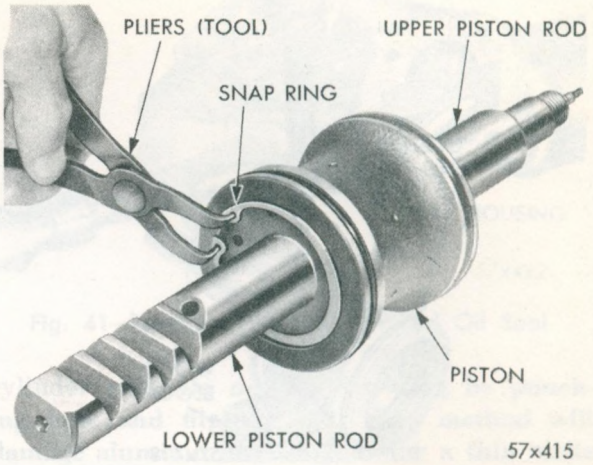

Fig. 30—Removing Lower Piston Rod Snap Ring

pin into upper rod using a ¼ inch round drift, as shown in Figure 33. Using snap ring pliers Tool C-3106, remove upper piston rod retaining snap ring. Carefully work upper piston rod out of piston, as shown in Figure 34. Insert wire (or paper clip) down through piston pin, bend inserted end over through oil passage hole in rod. Pull piston pin out of piston

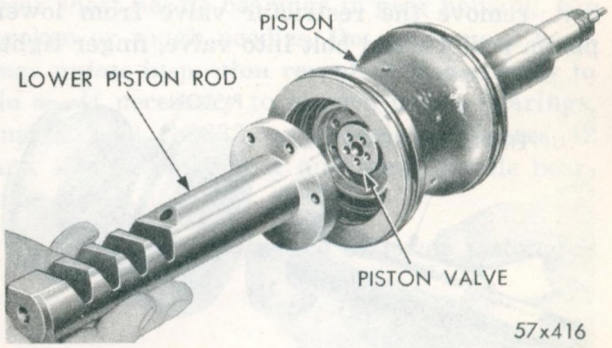

Fig. 31—Removing or Installing Lower Piston Rod

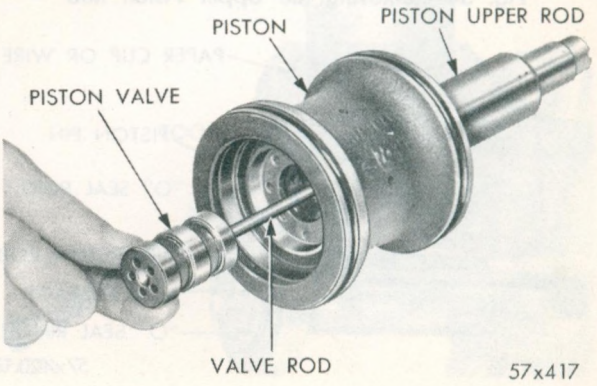

Fig. 32—Removing the Piston Valve

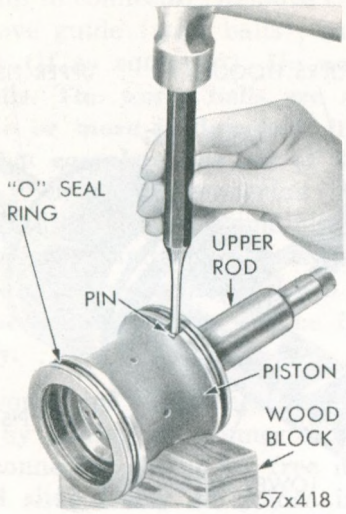

Fig. 33—Driving Pin into Upper Piston Rod

rod, as shown in Figure 35. Discard "O" seal ring.

Remove large "O" seal ring from base of upper rod, using a paper clip, remove valve rod "O" seal rings from each end of upper rod, as shown in Figure 36. Remove and discard "O" seal rings (piston rings) from each end of piston. Using a $\frac{7}{16}$"-14 (standard thread) bolt, remove the restrictor valve from lower piston rod. Thread bolt into valve, finger tight.

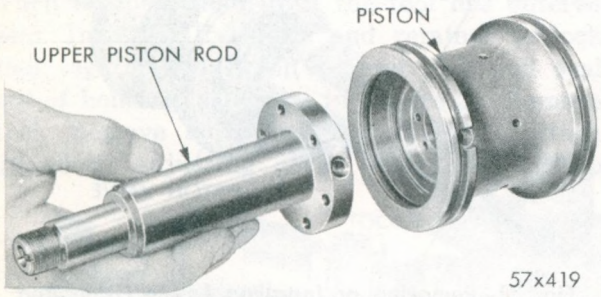

Fig. 34—Removing the Upper Piston Rod

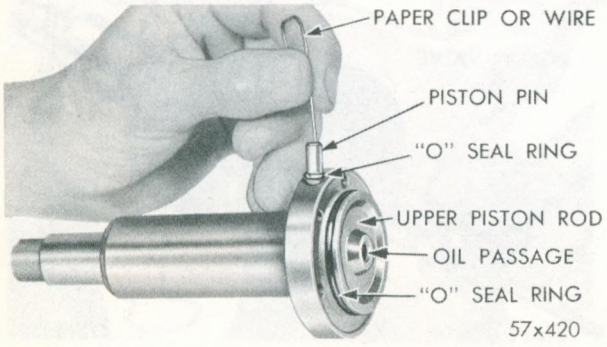

Fig. 35—Removing Piston Pin from Upper Rod

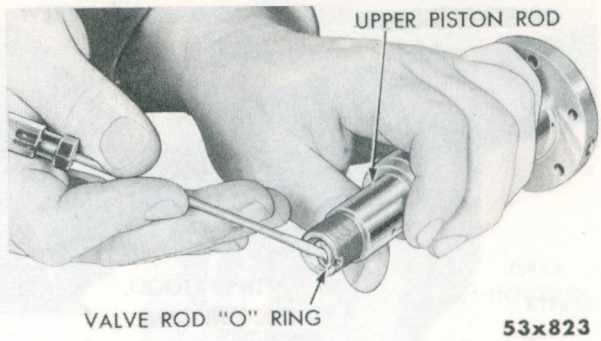

Fig 36—Removing Valve Rod "O" Seal Rings

Clamp head of bolt in a vise, rap on end of rod, using a fibre hammer. Slide valve out of rod, as shown in Figure 37. To disassemble valve, insert a stiff wire (paper clip) into pin hole and push out retaining pin. Remove plunger and spring.

The restrictor valve plunger should slide freely in valve body and show no signs of sticking. The lower piston rod should be free of burrs or scratches. The upper rod should be unmarked in the seal contact area. The valve port rings inside piston should have a bright, highly polished surface with sharp edges. The valve rod should slide freely through the "O" seal rings. Check valve rod, insert valve in

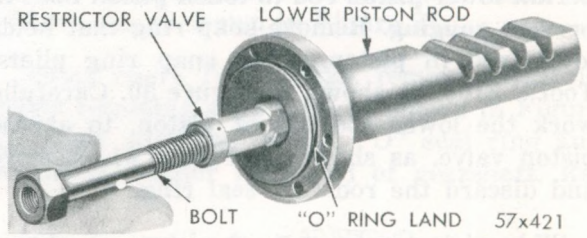

Fig. 37—Removing or Installing the Restrictor Valve

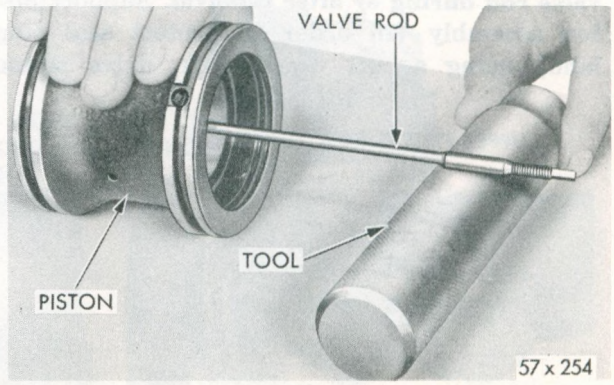

Fig. 38—Checking the Valve Rod for Trueness (Tool C-3333)

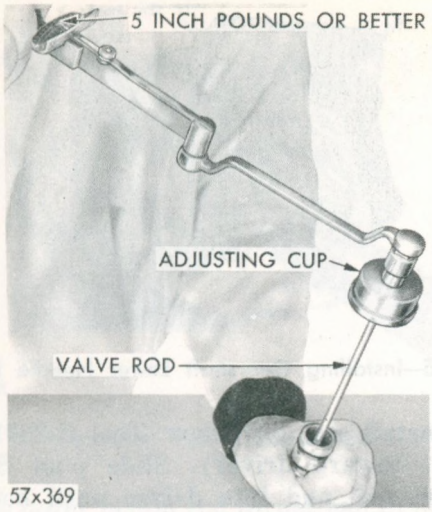

Fig. 39—Testing Torque of Adjusting Cup on Valve Rod

piston until centered. Lay piston on flat surface, place Tool C-3333 under valve rod, as shown in Figure 38. Rotate piston slowly. If rod is bent, the distance from the tool will vary. The rod must be tight in valve. If loose, install new assembly. The adjusting cup should grip threads of valve rod tightly. To check, install cup on end of rod, install Tool C-3380, as shown in Figure 39. The minimum reading should not be less than 5 inch-pounds torque. The piston "O" ring grooves should be free from nicks or burrs, with no sharp edges around piston pin hole.

21. DISASSEMBLING THE GEAR HOUSING

Using a suitable blunt drift, drive out welsh plug in the bottom of gear housing from the

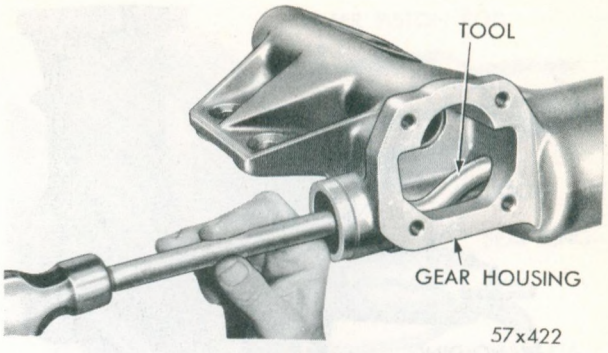

Fig. 41—Removing Lower Piston Rod Oil Seal

cylinder side. **Do not remove plug by punching hole and flipping out. This method will damage aluminum housing.** Using a thin blade screw driver, pry out lower piston rod thrust pad from gear housing Fig. 40. Remove lower piston rod oil seal from housing, using Tool C-3450. To remove seal, insert disc end of tool through opening in end of housing, locating disc between seal and housing shoulder. Using offset (curved) section as a fulcrum, force disc between seal and shoulder, until retainer screw almost contacts seal, (viewed from opposite end). Drive seal out of housing, using a hammer, as shown in Figure 41. Inspect steering gear shaft needle bearings in gear housing, for broken or rough needles. **Do not remove bearings unless inspection reveals it is necessary to do so.** If necessary to remove needle bearings, install Tool C-3332, as shown in Figures 42 and 43 and pull upper and lower needle bearings out of housing.

Inspect bearing surface of lower piston rod

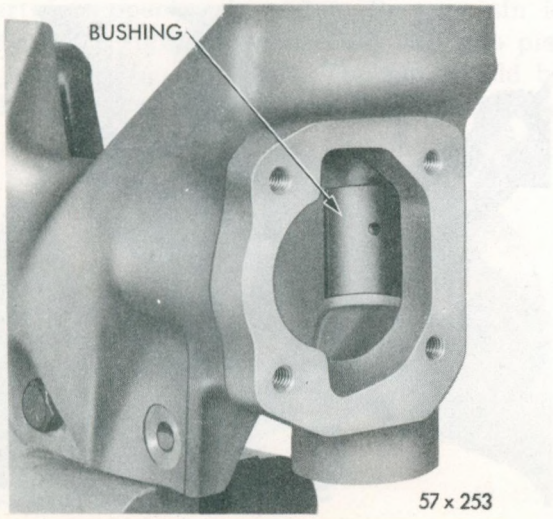

Fig. 40—Lower Piston Rod Thrust Pad

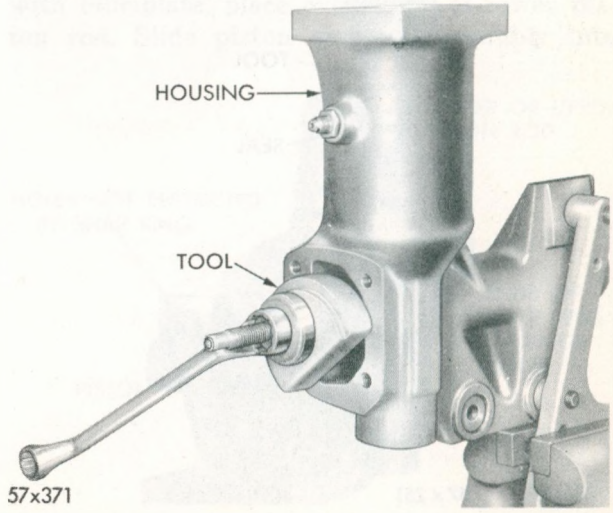

Fig. 42—Removing Upper Needle Bearing

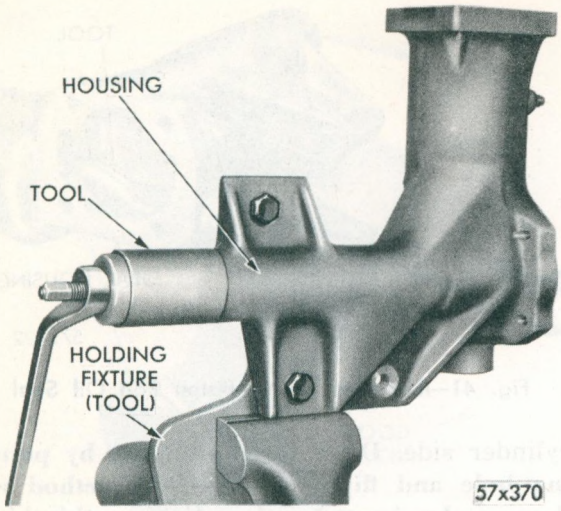

Fig. 43—Removing Lower Needle Bearing

thrust pad if scratched, install new thrust pad. Check piston cylinder walls for scoring, nicks or scratches. All machined surfaces of housing should be smooth and free from nicks or burrs. The steering gear unit has now been disassembled as far as necessary for cleaning, inspection and the replacement of worn or damaged parts.

Clean all parts in a suitable solvent and blow dry with compressed air. Be sure and use new "O" seal rings and seals at reassembly. Coat seals and "O" seal rings with lubriplate at installation.

22. ASSEMBLING THE GEAR HOUSING (Fig. 6)

Remove garter spring from new piston rod

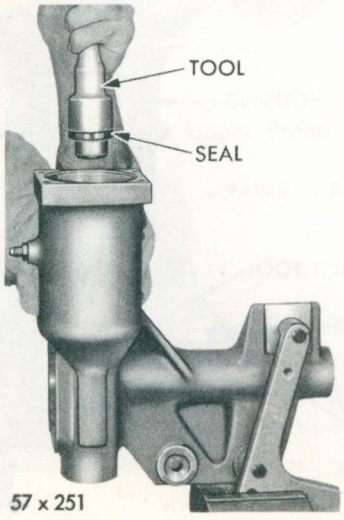

Fig. 44—Installing Lower Piston Rod Seal

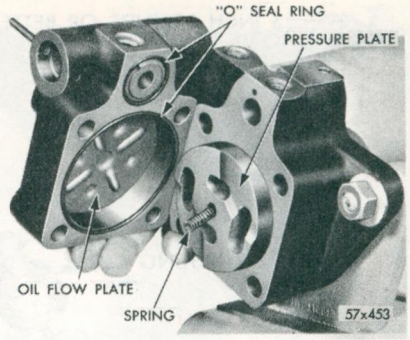

Fig. 45—Installing Gearshaft Lower Needle Bearing

seal, install seal on driver Tool C-3331. (Lip of seal toward driver). Slide pilot SP-1927 through seal and into driver until bottomed. Insert assembly into housing (keeping tool centered in bore), as shown in Figure 44. Drive seal into position, remove tool. **Carefully** work garter spring into seal with the aid of two long shank screw drivers. (If Tool C-3331-A is used, it will not be necessary to remove garter spring).

Slide gearshaft lower needle bearing (if removed) over pilot of Tool C-3333, (lettered end against driver) and insert into housing. Drive needle bearing into housing, as shown in Figure 45. The outer end of bearing should be $1\frac{1}{16}$ inches from end of housing when properly seated. Slide the gearshaft upper needle bearing (if removed) over pilot of Tool C-3333, (lettered end against driver) then insert into housing. Drive needle bearing into housing, as shown in Figure 46. The outer end of bearing should be flush with end of bore when properly seated.

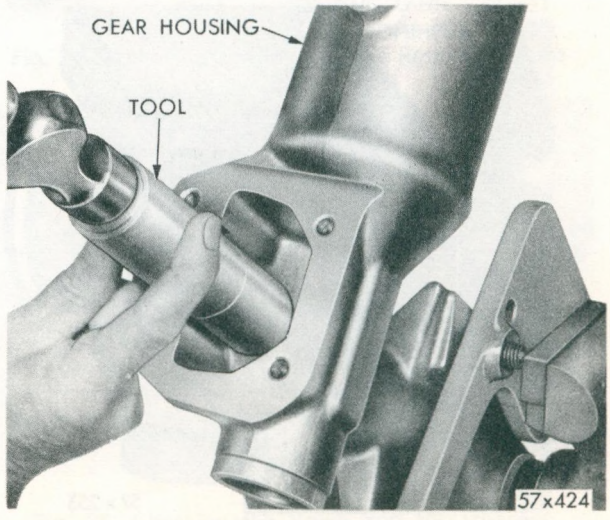

Fig. 46—Installing Gearshaft Upper Needle Bearing

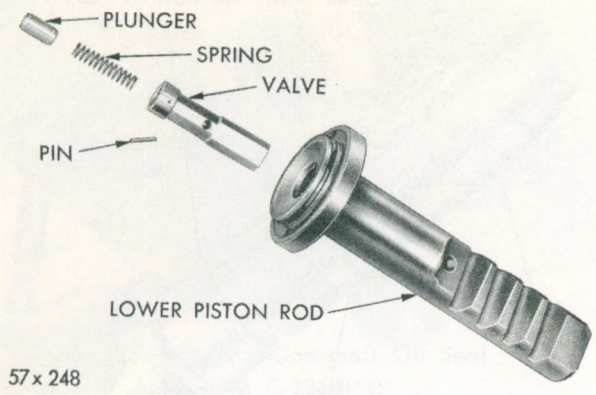

Fig. 47—Restrictor Valve (Disassembled View)

Place lower piston rod thrust pad in position, (Fig. 40) align shoulder with recess in housing and press into position.

23. ASSEMBLING THE PISTON AND RODS

Slide restrictor valve spring and plunger into valve body, as shown in Figure 47. Secure with pin, install assembly into lower piston rod bore. Press until flush with end of bore. Check plunger for free operation in valve. Check grooves to be sure they are free of dirt and chips. Install two new valve rod "O" seal rings in each end of upper piston rod, as shown in Figure 48 and 49. (Be sure the "O" rings are seated evenly in the grooves). Coat a new "O" seal ring with lubriplate, slide into position in groove on end of upper piston rod. Carefully slide the rod into piston aligning piston pin holes.

Align new "O" seal ring over piston pin, insert into opening in piston. Be sure pin is perfectly straight, then carefully tap into piston, using a ¼ inch drift. The pin should be flush in piston. Using pliers Tool C-3106, install retaining snap ring (bevelled side out). **Be sure that ends of snap ring do not obstruct an oil passage, as shown in Figure 50. Any obstruction at this point will affect steering performance.** It may be necessary to tap the snap ring, using a brass drift, to be certain it is fully expanded in groove. Slide valve and rod into piston and upper rod, working carefully past "O" seal rings previously installed, as shown in Figure 51. **Be careful not to bend the rod.** Slide new "O" seal ring into position in groove on bottom of lower piston rod. Carefully slide rod into piston and down into position. Using pliers Tool C-3106, install retaining snap ring (bevelled side out). **Be sure ends of snap ring do not obstruct an oil passage, (Fig. 50). An obstruction at this point will affect steering performance.**

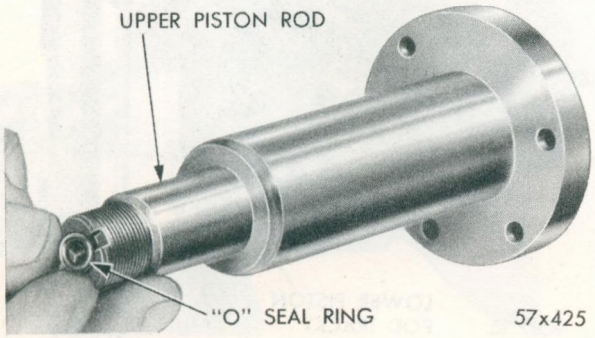

Fig. 48—Installing Upper Valve Rod "O" Seal Ring

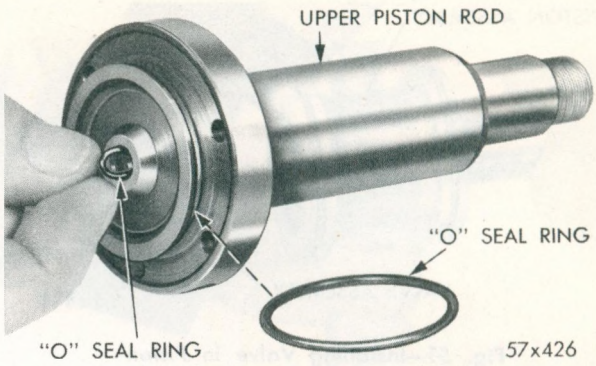

Fig. 49—Installing Valve Rod Lower "O" Seal Ring

Install new "O" seal rings on each end of piston, locate Tool C-3344 on gear housing (around cylinder bore). Coat Tool C-3554 with lubriplate, place over teeth of lower piston rod. Slide piston and rod assembly into

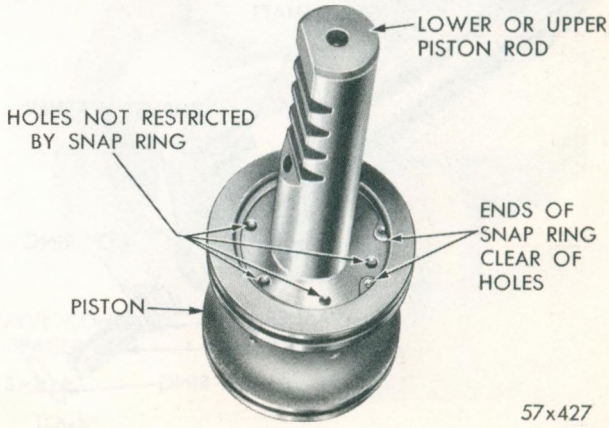

Fig. 50—Snap Ring Correctly Installed

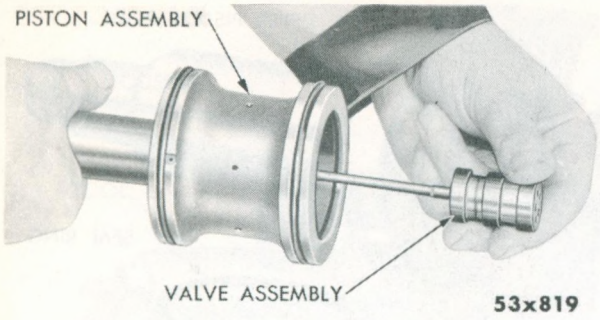

Fig. 51—Installing Valve in Piston

cylinder bore, as shown in Figure 52. Guide seal protector Tool C-3554 out of lower housing (through cover opening), as piston is being pushed into cylinder. As piston is being installed, align teeth on lower rod for meshing with teeth on gearshaft. Remove tools.

24. INSTALLING GEAR SHAFT

Slide gearshaft adjusting screw thrust washer into position in end of shaft, install adjusting screw and retaining washer (Fig. 53). Install snap ring. Install Tool C-3401 over end of adjusting screw and slide down until seated. Slide

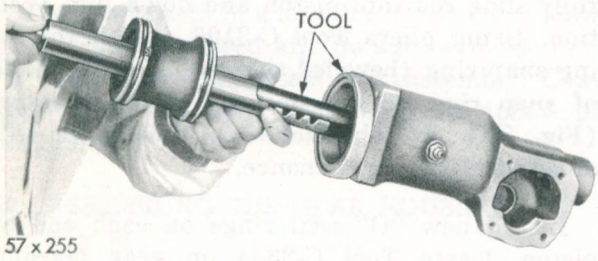

Fig. 52—Installing Piston in Gear Housing

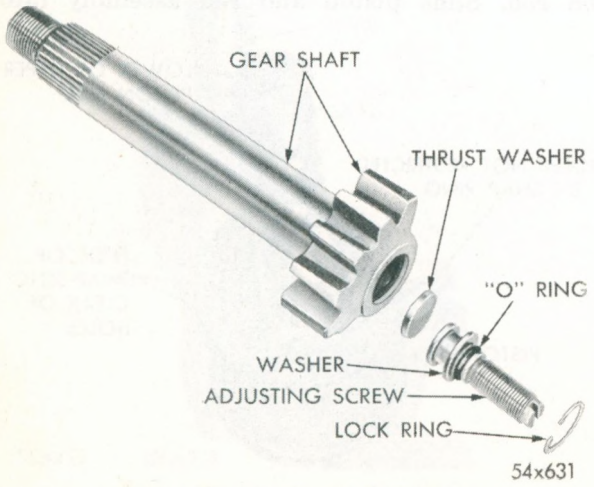

Fig. 53—Adjusting Worm Housing

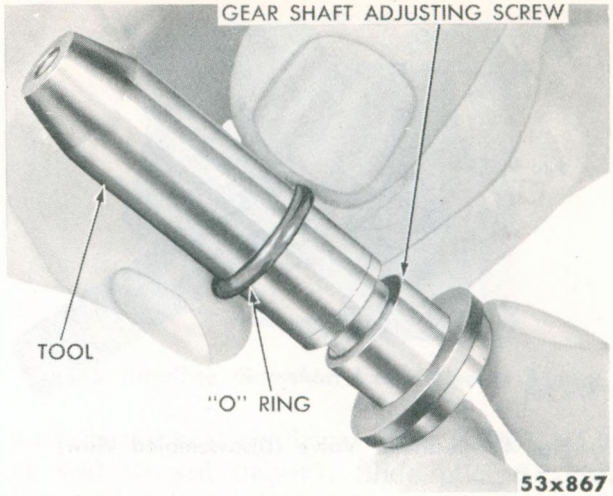

Fig. 54—Installing Gearshaft Adjusting Screw "O" Seal Ring

new "O" seal ring over tool and into groove of adjusting screw, as shown in Figure 54. (This operation may be done before installing screw).

Install sector gear to mesh with rack, as shown in Figure 55. Seat shaft to mesh teeth. Check gear timing, using steering gear arm to rotate gearshaft. Full piston travel must be approximately 2 inches. **Failure to follow the timing instructions will result in a broken gear housing.** Check operation of gears by rotating gear shaft. Place new gear shaft oil seal (suitably coated with lubriplate) lip side down, on a piece of clean paper. Carefully slide tapered end of sleeve (part of Tool C-3350) in seal and slide seal back approximately ¼ inch on sleeve. Slide sleeve and seal over shaft (lip of seal toward housing) until seal contacts

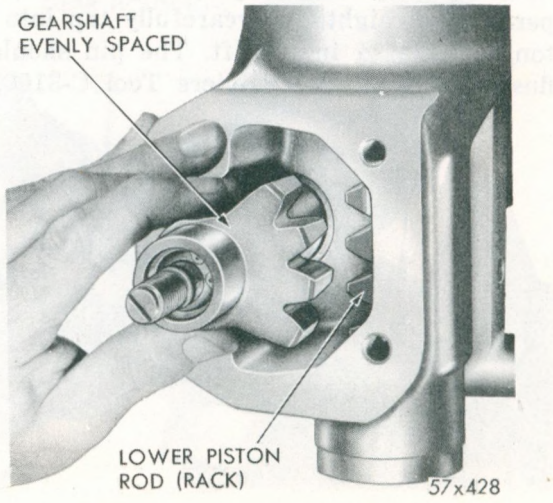

Fig. 55—Gear Tooth Alignment

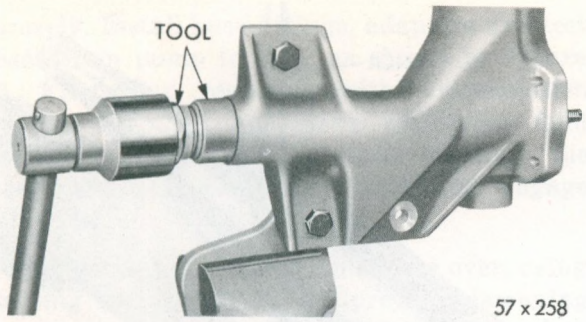

Fig. 56—Installing Gearshaft Oil Seal (Tool C-3350)

bore of housing. Slide adapter over sleeve, followed by coupling nut. Install seal in housing by turning nut on shaft threads until shoulder of adapter contacts housing, as shown in Figure 56. Remove nut and adapter.

Wrap new piece of friction tape around sleeve to provide a firm grip. Slide sleeve off gearshaft using a twisting motion, as shown in Figure 57. **Do not use any tool to remove sleeve.** Install oil seal retaining snap ring. Install a new "O" seal ring in groove on adjusting cover, place cover on adjusting screws and spin down as far as possible. Align cover with bolt holes. Using a screw driver, move adjusting screw out of cover until cover is seated on housing. (**Do not force**). Install bolts and washers (with seals), in inside holes and tighten to 30 foot-pounds torque. Install adjusting screw locknut but do not tighten at this time. Place a new welsh plug in position at bottom of housing and drive into position.

25. INSTALLING THE VALVE CONTROL SPACER

Remove garter spring from a new upper piston

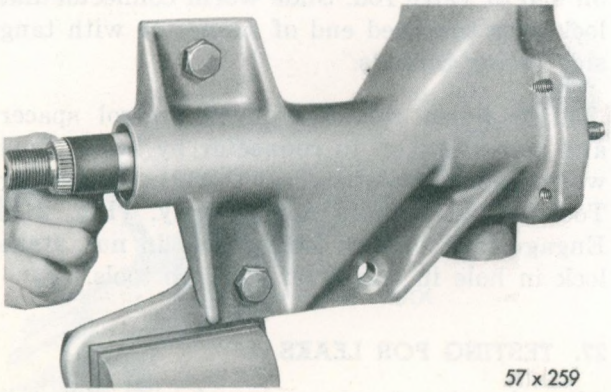

Fig. 57—Removing Oil Seal Protector Sleeve

Fig. 58—Installing Upper Piston Rod Seal

rod seal, position seal on driver Tool C-3331 with lip of seal toward driver. Install seal aligning pilot in end of driver. (If Tool C-3331-A is used it will not be necessary to remove garter spring). Place housing head on a flat surface (single flange side up) and seal into head until seated, as shown in Figure 58. Remove tool and reinstall garter spring.

Position a new "O" seal ring over shoulder on housing head, carefully slide head over piston rod and down against housing. Be sure "O"

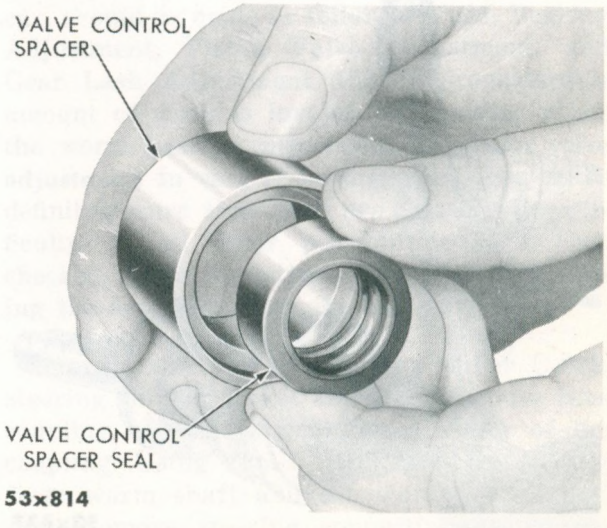

Fig. 59—Removing or Installing Seal in Valve Control Spacer

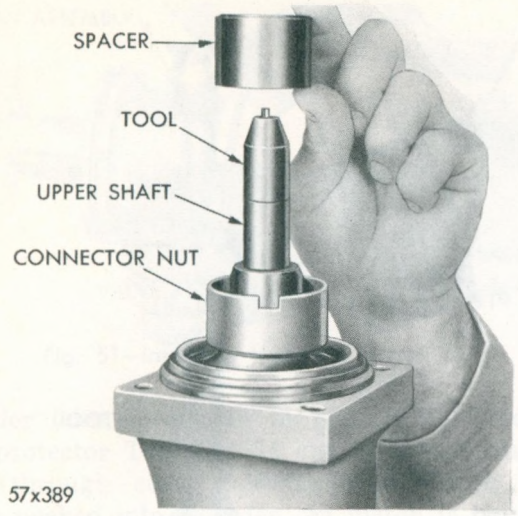

Fig. 60—Installing Valve Control Spacer

seal ring is seated. Slide the connector nut over piston rod with threaded end out. Slide a new control spacer seal into spacer and install retainers, as shown in Figure 59. Place seal protector Tool C-3329 over threads on upper rod. Slide spacer assembly over tool and down against shoulder of upper rod, as shown in Figure 60. Remove seal protector tool.

Install upper piston rod nut and tighten with sharp rap of hammer on Tool C-3328. Install new lock cap over nut and index with slots in rod. Using a suitable punch, drive outer diameter into recess in nut, as shown in Figure 61.

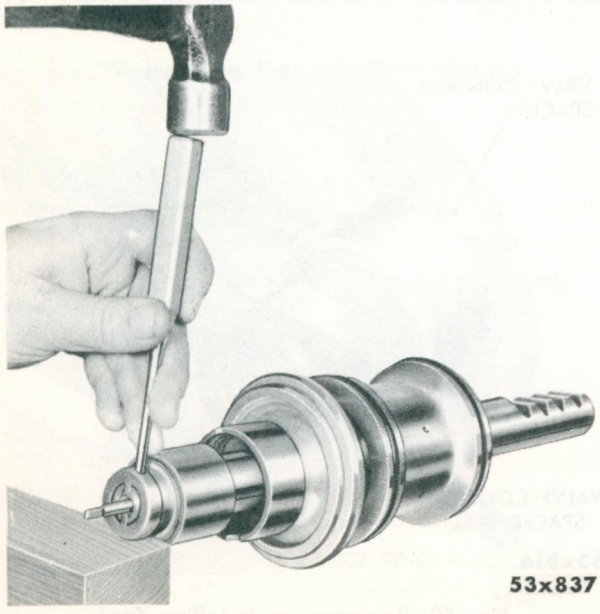

Fig. 61—Locking Upper Piston Rod Nut Lock

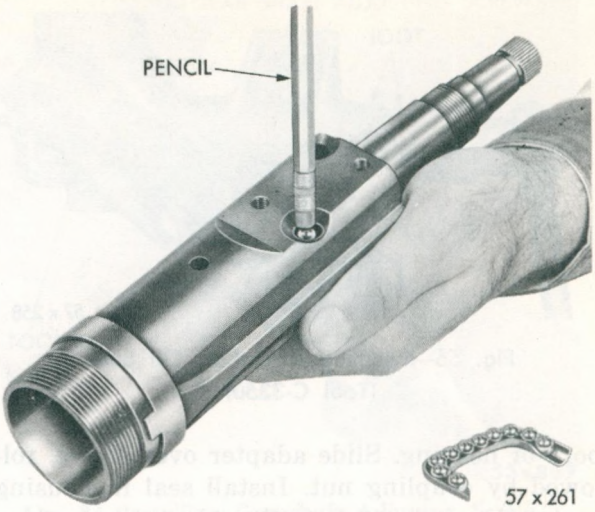

Fig. 62—Installing Balls in Worm Connector

26. ASSEMBLING AND INSTALLING THE WORM CONNECTOR

Slide worm into connector and visually align upper portion of passages with ball guide holes. Insert 30 balls (no more), into lower hole by pushing them gently, using rubber end of pencil, and at same time, oscillating worm, as shown in Figure 62. When 30 balls have been inserted, they should be visible in the hole. Place remaining (10) balls in either half of ball guide. Grease balls to help hold them in place, then place the other half over balls.

Insert guide and ball assembly into holes in connector (Fig. 62). Install clamp, lock washers and bolts. Tighten bolts to 12 foot-pounds torque. Check operation of worm, making sure it is free to turn the maximum travel of worm shaft. The worm should rotate freely by its own weight in either direction. **Do not allow worm to bottom.** Install valve adjusting cup on end of valve rod. Slide worm connector nut lock over threaded end of connector with tang side facing threads.

Slide worm connector over control spacer and screw nut on to connector by hand. Hold worm connector with Tool C-3321, then using Tool C-3326, tighten nut securely. (Fig. 21). Engage tank of lock with recess in nut, stake lock in hole in connector, remove tools.

27. TESTING FOR LEAKS

Align housing head to gear housing, install Tool C-3555 over head. Install bolts and tighten

securely. Install hose fittings, adapters and test hoses from pump to unit, as shown in Figure 63. Fill pump reservoir with Transmission Fluid Type "A" and have additional fluid available. Install Tool C-3445 through the worm shaft (forked end first) and engage valve rod.

Remove coil wire and turn engine over, using starting motor. (This will prevent damaging the steering unit should valve be positioned to give excessively fast self steering).

As steering gear fills, it will self steer and reservoir will need additional fluid. **Be ready to turn the valve to stop self steering before piston reaches limit of travel.** Turn valve to right if piston moves up, and to left as piston moves down. Fill reservoir. Allow unit to warm to full operating temperature then check for leaks. (This was a temporary valve adjustment. The final adjustment should be made after unit is completely assembled).

28. INSTALLING WORM HOUSING

Slide new "O" seal ring on smallest land of housing head. Slide a bearing race over worm shaft followed by a thrust bearing and a race. Slide spacer and needle bearing assembly into housing past the rail guides. Press shoulder of bearing spacer into housing, using a suitable tool. Turn connector until ball guide is directly down and rails are aligned. Slide worm housing over connector with vent on top side. **Use care so as not to force "O" seal ring off housing head.** Hold housing in alignment with connector rails, then seat against gear housing. (Worm housing must meet gear housing with **hand pressure only**). Install attaching bolts and washers. Tighten 30 foot-pounds torque.

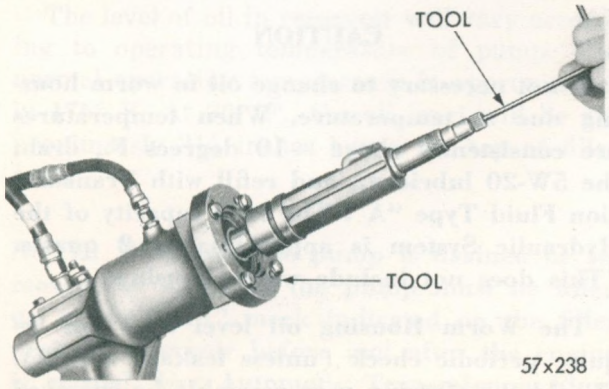

Fig. 63—Testing Steering Gear for Leaks

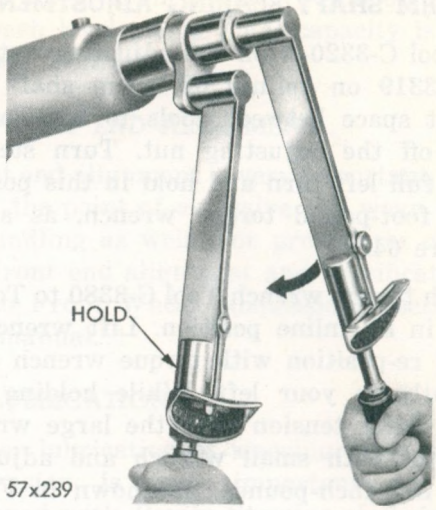

Fig. 64—Adjusting Worm Housing Bearings (Outer)

Slide bearing spacer over worm shaft (shoulder towards worm) and seat in housing. Slide bearing race, radial bearing and race over worm shaft and down against spacer (Fig. 17). Install **new** adjusting nut with locking flange up. Pour 14 oz. of Transmission Fluid Type "A" into upper housing, install filler plug. Make worm bearing adjustment, piston valve adjustment and the gear adjustments as described in the Steering Gear Adjustment Paragraph 22.

29. ADJUSTING THE POWER STEERING

The three adjustments, all of which can be made without removing the assembly from car, should be made as follows: Worm Bearing Adjustment, Piston Valve Adjustment, and Gear Lash Adjustment. Since a considerable amount of work is involved in making either the worm **bearing adjustment or piston valve adjustment** in car. It is suggested, you make definitely sure that they are causing the difficulty. If all other possibilities have been checked, make the adjustment without removing the assembly from the car, as follows:

Remove steering wheel using puller C-612, steering column jacket and tube. Remove tube coupling bolt and washer from center of the coupling. Using Tool C-3392, remove coupling from worm shaft and the worm housing oil seal. Remove steering connecting rod (drag link) from steering gear arm. Back off gear lash adjusting screw until the lash is maximum.

30. WORM SHAFT BEARING ADJUSTMENT

Slide Tool C-3320-A on the adjusting nut, and Tool C-3319 on splines of worm shaft with sufficient space between tools to lift Tool C-3320-A off the adjusting nut. Turn steering gear to full left turn and hold in this position with a foot-pound torque wrench, as shown in Figure 64.

Attach torque wrench Tool C-3380 to Tool C-3320-A in an inline position. Lift wrench off nut and re-position with torque wrench down or slightly to your left. While holding five-pounds (left) tension with the large wrench, loosen nut with small wrench and adjust to exactly five inch-pounds, as shown in Figure 65. Remove tools with extreme caution so as not to move adjusting nut. Crimp ring section of adjusting nut into keyway in worm shaft, with care so as not to move adjusting nut. Install worm housing seal.

31. PISTON VALVE ADJUSTMENT

Start engine and run at medium idle speed. Allow steering gear to reach maximum normal operating temperature. Attach a small tap handle (or equivalent) to the flat on end of Tool C-3445, insert tool through worm shaft over end of piston valve rod. With foot-pound torque wrench on steering arm nut, read tension while turning the steering gear to full right and full left at moderate rate. Wrench movement should be smooth. Turn piston valve in direction necessary to produce the same torque reading in both directions. Torque reading must be equal and under 40 foot-pounds.

If torque reading is equal at less than 25 foot-pounds, a much more accurate adjustment can then be made with the 300 inch-pound torque wrench, using same procedure. Remove tools.

32. GEAR LASH ADJUSTMENT

With engine running and steering gear at normal operating temperature, turn steering gear to straight ahead position. Using a very light finger-tip touch at end of steering gear arm, turn gear shaft adjusting screw clockwise until all gear lash has been eliminated. Turn adjusting screw ¾ turn tighter (clockwise) and tighten lock nut. Stop engine. Install worm housing oil seal, lip of seal down.

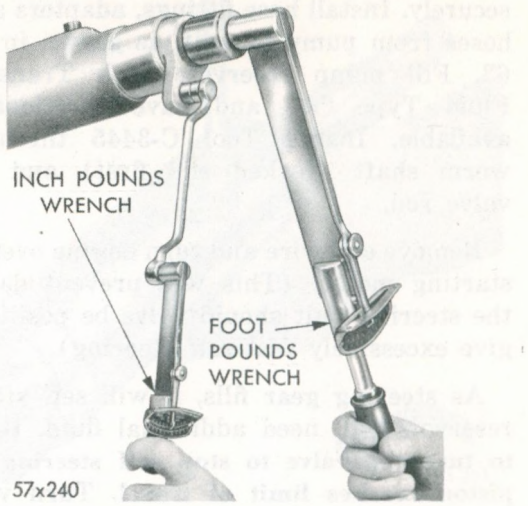

Fig. 65—Final-Worm Housing Bearing Adjustment

With gear still in straight-ahead position, install coupling on worm shaft with slot in up-and-down position. Install drag link on steering gear arm. Install steering tube, steering wheel, etc.

33. RESERVOIR AND WORM HOUSING

Since there is no hydraulic connection between worm and gear housing, the Power Steering has two separate fluid levels. The reservoir fluid level should be checked regularly every 1,000 miles or 30 days. Make sure top of reservoir is absolutely clean. Remove cover or filler cap and check oil level. **An oil level mark is stamped on the inside of the reservoir or on dipstick of style using the filler cap. Replenish as necessary with Transmission Fluid Type "A". When temperatures are consistently below —10 degrees F., it is permissible to drain the hydraulic system and refill with SAE 5W-20 (Multi Visc) Engine Oil.**

CAUTION

It is not necessary to change oil in worm housing due to temperature. When temperatures are consistently above —10 degrees F., drain the 5W-20 lubricant, and refill with Transmission Fluid Type "A". The total capacity of the Hydraulic System is approximately 2 quarts. (This does not include worm housing).

The Worm Housing oil level does not require periodic check (unless leakage occurs). Should the steering gear assembly be removed for any reason, however, it should be checked

at that time. The oil should be level with the filler plug opening when the gear assembly is in an installed position. Replenish as necessary with Transmission Fluid Type "A".

34. DRAINING HYDRAULIC SYSTEM

Should it become necessary to drain hydraulic system, proceed as follows: **Extreme care should be taken to prevent dirt from entering reservoir while cover or filler cap is removed.**

Disconnect the high pressure (small) hose at gear housing and jack up front end of car. Place hose in suitable container. While holding hose in container start engine and allow to idle. Turn steering wheel from one extreme to the other until all fluid is forced from unit. **Do not run engine above idle speed. As soon as fluid starts to show great quantities of air bubbles, stop engine.** Reconnect high pressure hose and refill.

35. REFILLING HYDRAULIC SYSTEM

If oil has been removed from hydraulic system, bleed steering gear as follows: Fill reservoir slightly higher than normal. Start engine and allow to run for a short time to circulate oil through the hoses. With the engine running at idle speed, turn the steering wheel back and forth several times from extreme right to left to bleed any remaining air out of the system. Check oil level in reservoir. Add oil if needed to reach level mark. Total capacity is approximately 2 quarts.

36. FRONT END ALIGNMENT

Front end alignment is very important, not only from the point of excessive tire wear, but care of handling as well. For procedures on checking front end alignment and specifications, refer to Front Wheel Suspension, Section I, in this manual.

37. LUBRICATION

Proper lubrication of steering gear and front suspension is very important on vehicles equipped with Power Steering. Lubrication of tie rods remain the same as specified for manual steering.

38. TIE RODS

Whenever it becomes necessary to install new tie rods and/or tie rod ends, make definitely sure when adjusting toe in, that both tie rod end tubes are turned an equal amount and are of equal length. **Clamp bolts must be positioned horizontally below tube. Make sure tie rod ball studs are positioned so they do not bind on edges of sockets, check by turning the tie rods back and forth after clamp bolts have been tightened.**

COAXIAL POWER STEERING PUMP

A sleeve type Power Steering Pump is used on all Chrysler 1957 Models (Fig. 66). When servicing the Power Steering Pump the following procedures should be followed:

The level of oil in reservoir will vary according to operating temperature of pump. The normal operating temperature is approximately 175° F. At 70° F., the oil level will be approximately 3¼ inches below the top of filler neck.

NOTE: Whenever the pump is drained or removed for servicing the pump must be filled up to the "full" mark indicated on the filler neck of reservoir before and after the engine is started. Use Automatic Transmission Fluid Type "A" oil.

CAUTION

The oil level should never be allowed to fall below the baffle of the reservoir.

39. REMOVAL AND INSTALLATION (Fig. 67)

a. Removal

Remove hose clamp and hose from discharge outlets. Loosen bracket fan belt adjusting screw and remove fan belts. Remove pump.

b. Disassembly

Do not disassemble the hydraulic pump in dirty surroundings or on a dirty work bench. Use clean paper on bench. After the pump has been disassembled, place the parts in a suitable cleaning solvent; clean and protect from dirt

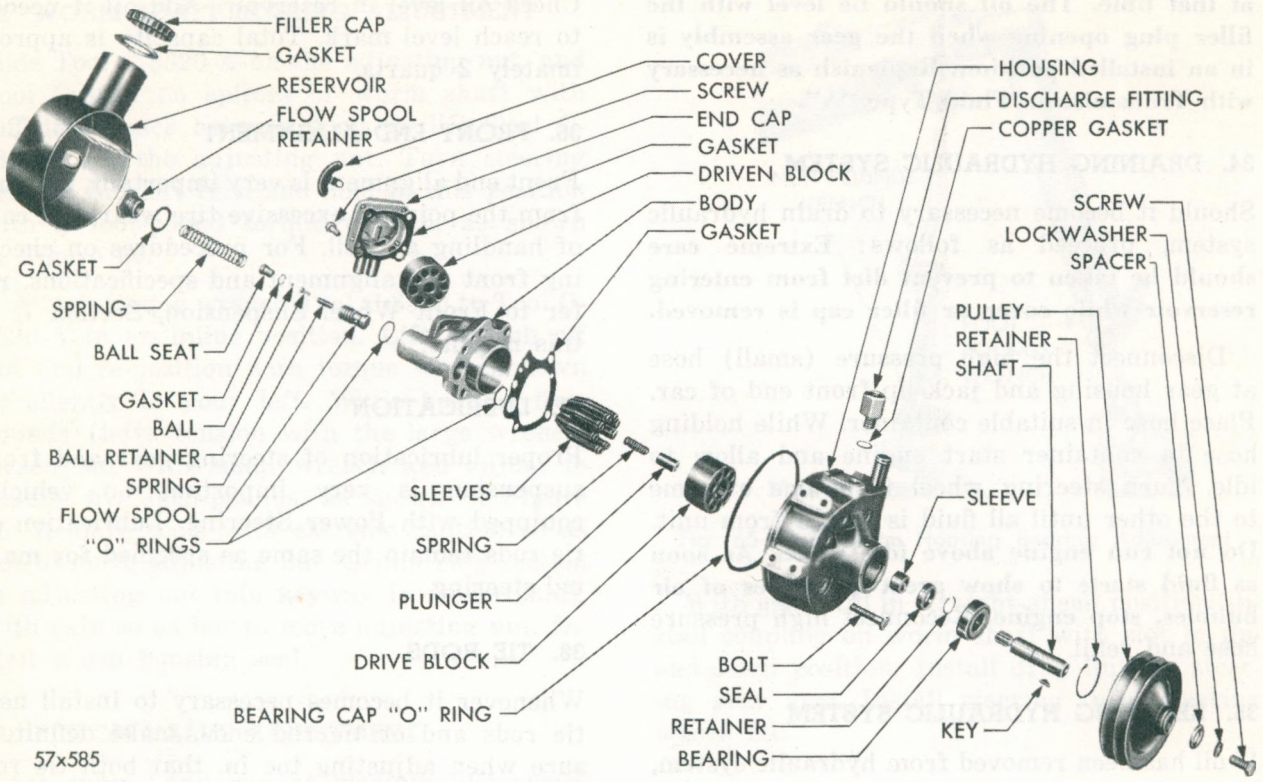

Fig. 66—Power Steering Oil Pump (Disassembled View) (Thompson Pump)

and grit. Drain oil from pump and reservoir. Cap discharge and return line fittings with protective closures to exclude dirt from pump. Thoroughly clean exterior of pump. Mount pump in a vise. Remove cap screw and reservoir. (Fig. 68). Loosen four cap screws at the inlet end cap (Fig. 69). Remove flow valve spring retainer fitting.

CAUTION

Flow and plunger springs are under pressure. Use care when removing cap and retainer to prevent spring and fitting from escaping due to spring force. Remove flow valve and spring. Remove and disassemble both end caps from inlet cap body and pump housing (Figs. 69

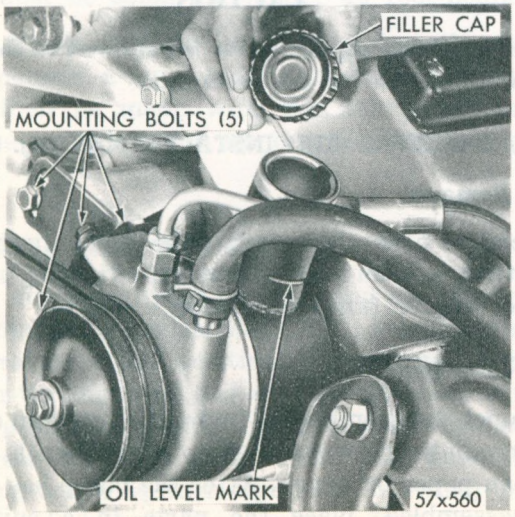

Fig. 67—Sleeve Type Power Steering Pump Installed

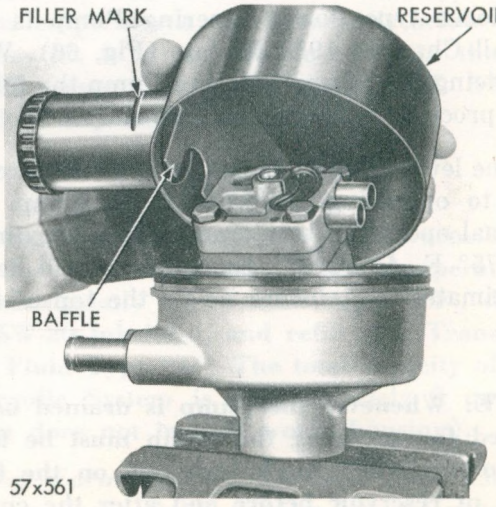

Fig. 68—Removing or Installing Power Steering Pump Reservoir

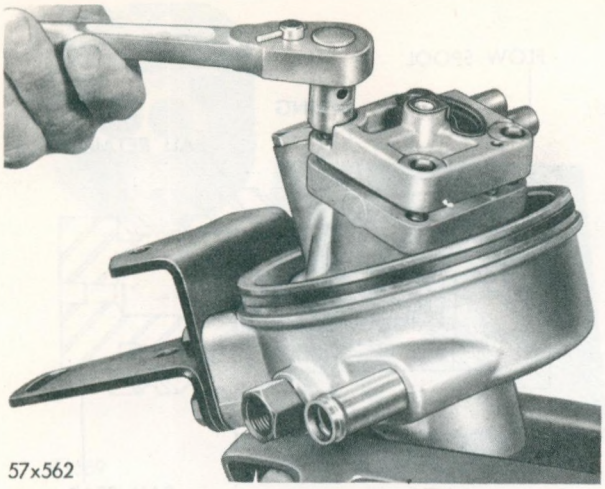

Fig. 69—Removing or Installing Inlet Cap Bolts

and 70). Plunger spring will tend to push the cylinder blocks out of body. Use care when disassembling.

The cylinder blocks will push out of body slightly due to pressure of plunger spring between blocks. Remove cylinder drive blocks and nine sleeves from pump body (Fig. 71), as well as cylinder plunger spring. Remove ball bearing retainer ring from housing, using snap ring pliers Tool C-3106 (Fig. 72). Remove shaft and bearing (Fig. 73).

40. CLEANING AND INSPECTION

Wipe bearing and shaft assembly with clean, lint free cloths. Do not soak in cleaning solvent; the lubricants sealed into the ball bearing may become diluted by the solvent.

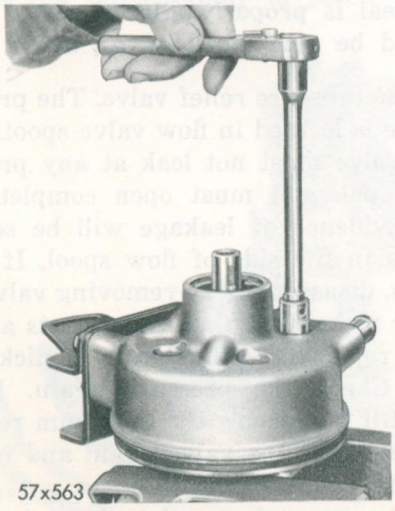

Fig. 70—Removing or Installing Pump Body from Housing

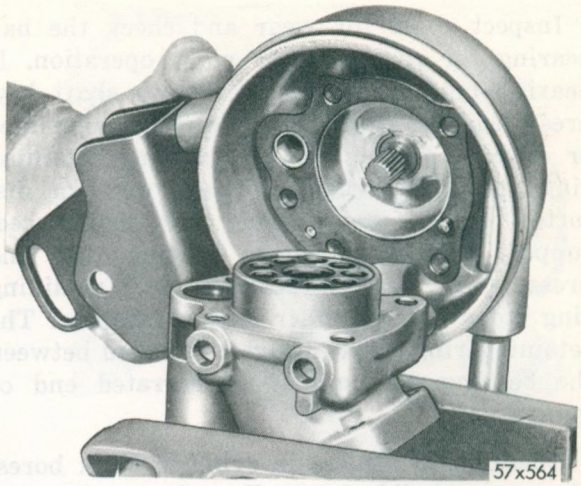

Fig. 71—Removing or Installing Housing from Pump Body

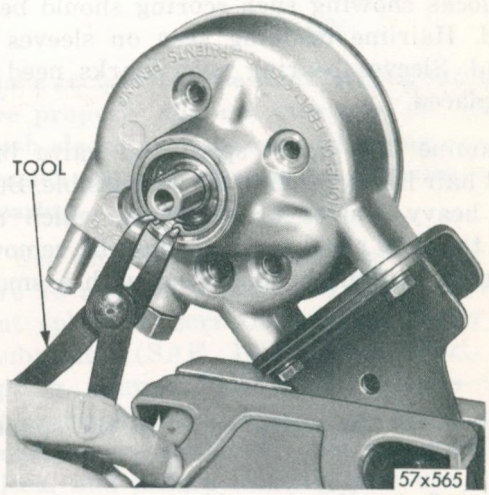

Fig. 72—Removing or Installing Snap Ring Bearing Retainer (Tool C-3106)

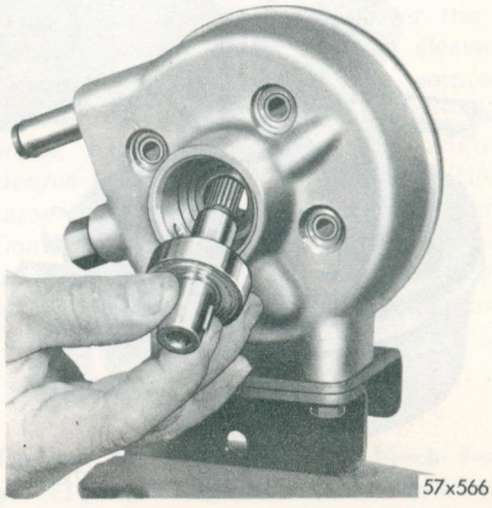

Fig. 73—Removing or Installing Shaft and Bearing

Inspect shaft for wear and check the ball bearing for roughness or noisy operation. If bearing must be replaced, remove shaft key, press bearing from shaft away from splined or serrated end of shaft. Examine retaining ring groove in housing, replace worn or distorted parts. If ball bearing is to be replaced, support bearing on inner bearing race and press shaft through bearing until retaining ring stops against inner race of bearing. The retaining ring must always be located between the bearing and splined or serrated end of pump shaft.

Check fit of sleeves in cylinder block bores. Sleeves must slide freely. Examine mating surfaces of sleeves and bores. Heavy scoring, if present, can impair pumping efficiency; cylinder blocks showing such scoring should be replaced. Hairline marking seen on sleeves are normal. Sleeves bearing such marks need not be replaced.

Examine flow valve spool and valve liner. Slight hair line scratches are permissible. Burrs from heavy gouges or scratches which may cause the flow spool to stick must be removed. This may be done by polishing with a smooth stone.

CAUTION

Do not break the sharp edges of the spool or liner.

Insert flow valve in valve body. (Fig. 74). By means of a pencil or other such rod which will not mar the internal diameter of valve

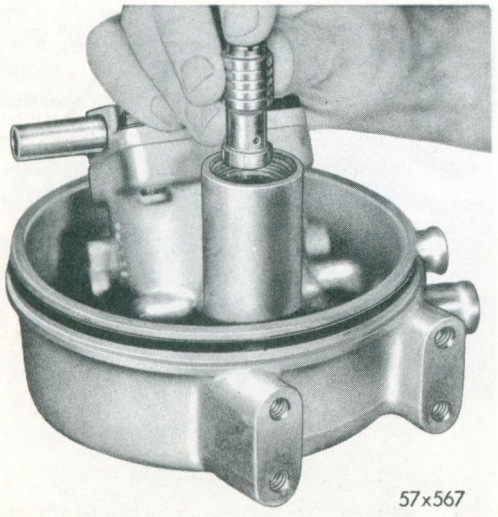

Fig. 74—Checking Flow Valve in Housing

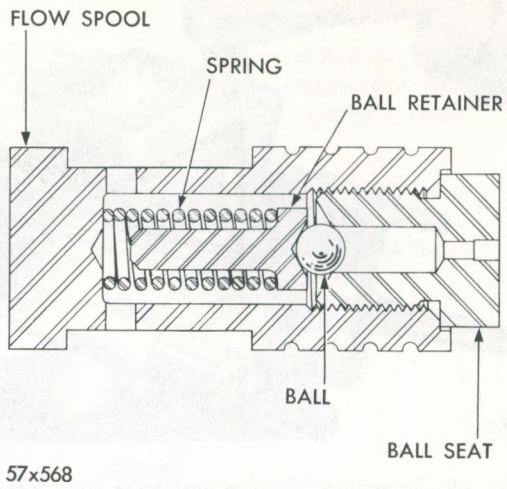

Fig. 75—Flow Spool Valve

liner, move flow spool back and forth to inspect. On each pass, rotate spool slightly. The spool must slide freely If spool sticks or drags, remove it from liner. Remove dirt, nicks, and burrs, using above caution and check by repeating above procedure.

Examine shaft seal in bearing cap. If worn or damaged, replace seal.

NOTE: The lips of seal must point toward the casting. Examine running surfaces of bearing cap and inlet end cap. If heavy scratches or gouging are present or if port edges are damaged, the part should be replaced.

Press seal in until the shoulder stops against the bearing cap casting. Care must be used to see that seal is properly aligned. This operation should be performed on an arbor press.

Check the pressure relief valve. The pressure relief valve is located in flow valve spool. (Fig. 75). The valve must not leak at any pressure below 750 psi. and must open completely at 900 psi. Evidence of leakage will be seen at small holes in the side of flow spool. If relief valve leaks, disassemble by removing valve seat for dirt or nicks. Clean all valve parts and reassemble, replacing valve seat if nicked or damaged. Check the pressure again. If the pressure still falls below the minimum requirement, disassemble the valve again and replace the pressure relief spring or place a $\frac{1}{32}$ inch washer between spring and ball retainer. To correct pressures exceeding the maximum requirement, remove valve seat and place a $\frac{1}{32}$

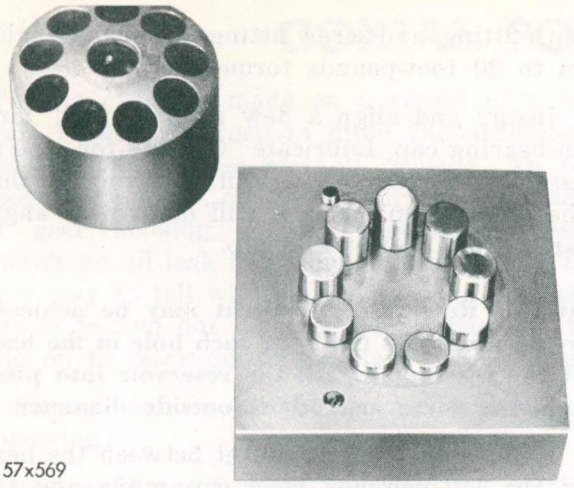

Fig. 76—Drive Block Assembling Fixture

inch washer between valve seat and the flow spool body.

Examine the pump body for signs of unusual wear or damage. Small scratches or burrs can be removed with fine emery paper. If body is scored or damaged, a new pump body should be used.

41. ASSEMBLY OF POWER STEERING PUMP

Clean parts thoroughly and assemble pump in a clean work place.

Press drive shaft and bearing sub-assembly into bearing cap. Check rotation of shaft to make certain shaft turns freely. Use a sleeve which bears on outer race of ball bearing, and press the sub-assembly in place.

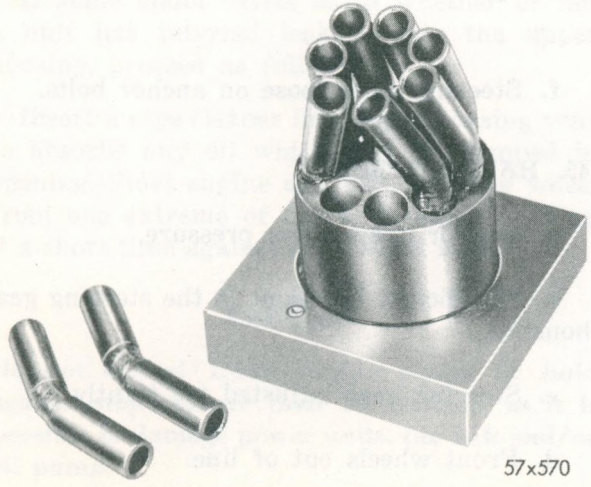

Fig. 77—Assembling Sleeves in Drive Cylinder

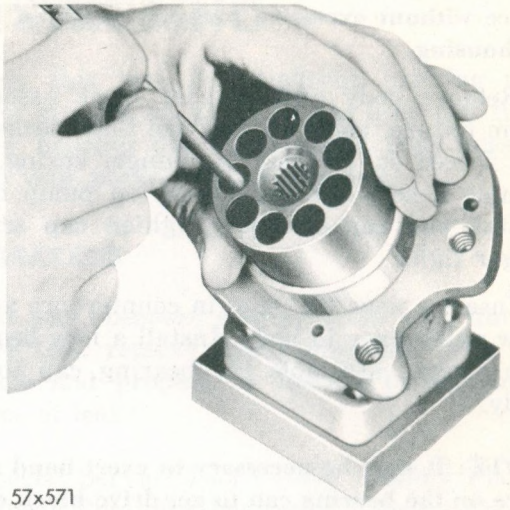

Fig. 78—Installing Drive Block

CAUTION

Make certain that the shaft bearing sub-assembly are properly aligned, otherwise the shaft may push sleeve bearing out of bearing cap or may scratch or mar the inside diameter of sleeve bearing.

Use an assembly fixture, as shown in Figure 76 and place driven cylinder block (without spline or serration) on assembly fixture. Lubricate (SAE 10W) and insert plunger spring, plunger, and seven sleeves in drive block, as shown in Figure 77. Place the pump body, square end down, over the cylinder drive block, and fixture locating pins use a pointed probe to align the sleeves to a uniform spacing and install the two other remaining sleeves. Position the drive splined block with serration over the sleeves. Sighting thru the bores in the drive block for alignment, lower the cylinder block until it engages the two sleeves in the forward position. Again use pointed probe slightly smaller in diameter than the sleeve bores, Figure 78, correct the alignment of sleeves in the 5 and 7 o'clock position at the same time guiding cylinder block downward. Continue this procedure to the 4 and 8 o'clock positions until all of the sleeves are aligned and engaged; the block may then be pushed in all the way.

CAUTION

Do not force the cylinder block forcibly in place; proper alignment of the block and sleeves will allow the block to be pushed easily into

place without excessive pressure. Tighten body to housing.

Remove body and cylinder block assembly from fixture, using care to see that blocks are not forced out of body by plunger spring. Assemble a new end cap gasket on pump body. Install end cap on body, tighten cap screws finger tight.

Insert a new "O" ring in counterbore at the flow valve liner in body. Install a new bearing cap gasket, assemble the bearing cap to the body.

NOTE: It may be necessary to exert hand pressure on the bearing cap to get drive block down into body after bearing cap is seated.

Tighten five cap screws finger tight. Grip end of pump shaft in a vise and rotate pump. The pump should rotate freely without binding. After making sure pump rotates freely tighten cap screws uniformly to 25 foot-pounds torque. Check pump again for rotation. Mount pump in a vise in a vertical position, gripping on the bearing hub. Install the flow valve spool with the $\frac{3}{16}$ land down. Place flow valve spring on top of flow spool. Replace "O" ring on flow spring retainer fitting. Compress flow spring with fitting, and screw fitting into place. Tighten to 20 foot-pounds torque.

Install and align a new reservoir "O" ring on bearing cap. Lubricate "O" ring for ease in assembling reservoir. Align reservoir so that the indentation on back will mate with angular boss on suction end cap.

NOTE: Reservoir alignment may be achieved by sighting thru the 9/32 inch hole in the back of the reservoir. Push the reservoir into place applying force around its outside diameter.

Replace the copper gasket between the head of the $\frac{1}{4}$ inch hex head cap screw and the back of reservoir. Tighten the $\frac{1}{4}$ inch cap screw to 15 foot-pounds torque.

CAUTION

Do not attempt to align or pull the reservoir into place on the angular boss with the $\frac{1}{4}$ inch cap screw.

Install shaft key, and pulley. Tighten pulley attaching bolt to 20 foot-pounds torque. Refill pump with Automatic Transmission Fluid Type "A" oil. Tighten fan belt as outlined in "Cooling System, Section V, Specifications.

SERVICE DIAGNOSIS (MANUAL)

42. EXCESSIVE PLAY OR LOOSENESS IN THE STEERING WHEEL

a. Steering gear adjusted too loosely or badly worn.

b. Steering linkage loose or worn.

c. Front Wheel bearings improperly adjusted.

d. Steering gear arm loose on steering gear shaft. Check damage to roller shaft and steering gear arm.

e. Steering gear housing attaching bolts loose.

f. Steering arms loose on anchor bolts.

43. HARD STEERING

a. Low or uneven tire pressure.

b. Insufficient lubricant in the steering gear housing.

c. Steering gear adjusted too tightly.

d. Front wheels out of line.

e. Steering column out of line.

COXIAL POWER STEERING

When a check is made on a report of a oil leak, be sure to keep in mind the difference between oil **leakage** and oil seepage. An oil spot on driveway, or one that drops on outside of gear housing, doesn't necessarily mean there's an oil leak in power steering unit. The only way to tell whether it's seepage or leakage is to find out whether owner has had to add oil to reservoir to maintain proper level.

Seepage can be caused by one or more of following:

a. Overfilling of upper housing. If a unit is filled level with filler plug opening, instead of using proper measured amount of oil, (14 oz.) it may show signs of seepage at vent due to expansion.

b. The normal breathing action of unit will leave a slight film of oil around vent opening.

c. Recently installed units. Oil becomes trapped in vent passage during shipping and drains out when unit is operated at mating surface between upper and lower housing.

If turning force is continued to be exerted on steering wheel after front wheels have reached their limit of travel and engine is accelerated excessively, it is possible to build up pump pressure in excess of 1,000 psi., which causes the power steering unit to flex at point when two housings are bolted together. Constant flexing at this point will cause seepage at the "O" ring. **THIS IS DEFINITELY AN ABNORMAL CONDITION.**

If some doubt exists as to whether or not a unit has internal leakage into the upper housing, proceed as follows:

Insert a pipe cleaner into upper housing vent to absorbe any oil which may be trapped in opening. Start engine and turn steering wheel from one extreme of travel to other, holding it a short time against each wheel stop.

CAUTION

Do not exceed 1,400 engine r.p.m. or hold against stops longer than 15 seconds, as it is possible to damage power units, fan belt and/or oil pump.

If there was no emission of oil from vent during this test, the condition existing was one of seepage or, all of oil has been lost from upper housing due to neoprene plug missing from vent passage inside housing.

44. LEAKAGE

If oil was observed coming from vent during above test, remove chuck assembly from the vehicle and proceed as follows to determine source of leak:

Special Service Tool C-3469 Dummy Flange Bulkhead Retaining has recently been released. This tool is essential in locating upper housing leaks in power steering unit.

Place chuck in holding fixture Tool C-3323. Connect test hoses Tool C-3211 and C-3318 so gear can be operated under pressure. Drain and remove upper housing. Using Tool C-3469, secure housing head. Remove all traces of oil around housing head, upper piston and connector assembly. Start engine and check for source of leaks.

NOTE: To build up pressure in unit when testing, it will be necessary to move control valve off center in each direction with adjusting Tool C-3445.

45. REACTION SEAL

Determined by oil coming from connector assembly. Inspect seal for signs of shrinkage or being damaged and replaced with new seal marked with silver "M". Check new seal prior to installation for snug fit in valve control spacer. Also inspect upper rod for being scratched at seal sealing surface.

46. CONTROL VALVE ROD UPPER "O" RING

Determined by oil coming from connector assembly. Remove "O" ring and inspect "O" ring seat for foreign material, nicks, or burrs. Install new "O" ring making sure it is seated properly in groove and cannot possibly come out of groove when pressure is applied. **Always** install new upper and lower valve rod "O" rings whenever gear is disassembled.

47. UPPER PISTON ROD SEAL

Due to oil leaking around the upper piston rod at housing head. Replace seal, at the same time inspecting seat in housing head for nicks and burrs: also check sealing surface on upper piston rod for scratches. Make sure seal is properly seated in housing head.

48. POROUS HOUSING HEAD

This can be noted by oil seeping through pores in housing head. If this condition exists, replace housing head.

49. LEAKAGE AT MATING SURFACE BETWEEN THE UPPER AND LOWER HOUSINGS

May be caused by looseness of three attaching screws which secure upper and lower housings. These screws should be torqued to 30 foot-pounds. If leakage was not caused by looseness of three attaching screws, or an abnormal operating condition, inspect for improperly seated or damaged "O" rings on housing, especially the one located on pressure side. Inspect the "O" ring seating surfaces on housing head and gear housing for nicks, burrs, and foreign material. Install new "O" rings.

CAUTION

Make sure upper "O" ring is installed properly, on upper or smaller diameter step, or damage to housing will occur when bolts are tightened.

50. LOWER HOUSING PLUG

Caused by improperly installed plug.

51. GEAR SHAFT OIL SEAL

Caused by damaged or improperly seated seal and/or snap ring. Replace seal. Remove steering arm with puller Tool C-3402. Remove old seal and install new seal with Tool C-3350.

52. GEAR SHAFT COVER

Leaks at gear shaft cover can be correct with removal of unit from vehicle.

a. Between gear shaft cover and housing. Due to loose cover attaching screws or damaged "O" ring. Tighten attaching screws to 20 foot-pounds torque. If leak persists, remove cover and replace "O" ring. Inspect mating surfaces of cover and housing for nicks, burrs, etc.

b. Around cover attaching screws. Two of these screws have neoprene seals, the two adjacent to engine do not. Make sure seals are installed properly or replace with new ones if needed.

c. Around threads of gear shaft adjusting screw. Due to damaged "O" ring. Remove cover and replace adjusting screw "O" ring.

Check for porosity of housing Can be corrected by peening the porous area.

53. NOISE IN CHUCK ASSEMBLY

Squealing (high pitched). If squeal is encountered only while applying turning force to steering wheel, it is an indication that pump drive belt adjustment is too loose. Make sure both top and bottom belts are adjusted to proper tension using Tool C-3379.

54. HISSING NOISE (NO LOAD)

Caused by low oil level or improper operation of back pressure valve, in lower position rod. Fill reservoir to proper level and recheck for noise. If noise is not eliminated, make following pressure checks:

Connect pressure gauge Tool C-3309 between the pump and pressure hoses. Open gauge valve and run engine at idle (475-500 r.p.m.). With engine idling, no turn effort being applied to steering wheel, and unit at operating temperature the gauge should show a pressure between 70-100 psi. If pressure is below 70 psi., it is an indication that lower piston rod relief valve is not operating properly. If pressure is considerably above 100 psi., the plunger may be sticking and preventing normal return pressure. If pressure is not within limits, install new back pressure valve assembly, making sure end plug is seated tightly against valve body.

(A) Hissing Noise (Right Turn Only)

This is caused by oil leaking past lower piston rod gear housing seal. Remove seal, with Tool C-3450, inspect lower piston rod and seal seat in gear housing for nicks, burrs, scratches, etc. Install new seal being sure it is properly seated in gear housing. Install seal with Tool C-3331.

(B) Hissing Noise Accompanied by Loss of Oil Through Upper Housing Vent (Left Turn Only)

This is caused by oil leaking past upper piston rod housing head oil seal. Remove seal, inspect upper piston rod and seal seat in housing head for nicks, scratches, burrs, etc. Install new seal being sure it is properly seated in housing head. Use same tools that were used on lower piston rod seal.

55. CREAKING NOISES ON TURNS

Probably due to loose gear to frame mounting bolts. Tighten bolts 60 foot-pounds torque.

56. SNAPPING NOISES

This is usually an intermittent noise which is produced when direction of steering wheel rotation is suddenly reversed. Tighten steering gear to frame mounting bolts. If noise still exists, remove steering chuck from vehicle and proceed as follows:

a. Check coupling screw for tightness.

b. Check lower piston rod bushing dowel pin for being too high.

c. Remove bushing and inspect for any foreign matter which may be under bushing, preventing it from seating properly.

d. Inspect bearing surface of bushing for signs of excessive roughness.

e. Install new bushing if needed, making sure it is seated properly in gear housing and head of dowel pin is slightly below bearing surface of bushing.

f. Check lower piston to assure a tight fit exists at piston. If looseness exists, it could possibly be due to too thin a snap ring or too wide a snap ring groove.

g. Replace necessary parts to assure a tight fit.

57. CHUCKLE NOISE

This noise will be most noticeable when vehicle is being operated on rough or choppy roads and usually is accompanied by wheel wander. This condition can be caused by any one or more of following items, each of which should be checked in following sequence:

a. Steering gear arm nut loose on gear shaft. Tighten 120 foot-pounds torque.

b. Loose front wheel bearing. Adjust bearings.

c. Gear shaft adjusted too loose. Adjust gear shaft.

d. Steering tube coupling screw loose. Tighten screw.

e. Worm bearing preload adjustment too loose. Adjust to proper preload with Tool C-3319 and C-3320 in combination with correct torque wrenches.

f. Excessive worm shaft end play in connector assembly. Replace worm and connector as an assembly (Part No. 1671270).

58. WANDER (STEERING WHEEL FREEPLAY)

This is a condition whereby operator has to constantly turn steering wheel in order to hold vehicle in a straight course. To determine whether or not this condition is caused by power steering unit, proceed as follows:

With front wheels in straight ahead position and resting on floor, start engine. Using a very light feather touch on steering wheel, check for freeplay. This should not exceed 5/8 inch.

CAUTION

Extreme care should be used when checking steering wheel freeplay, as it is rather difficult to check exact point where freeplay begins and ends.

If steering wheel freeplay exceeds 5/8 inch, without moving steering linkage, it is an indication that this difficulty is caused by one of following items in power unit, and should be checked in following sequence:

a. Gear Shaft adjustment too loose. Adjust gear shaft.

b. Steering tube coupling screw loose. Tighten screw.

c. Worm bearing preload adjustment too loose. Adjust to proper preload with Tools C-3319 and C-3320 and in combination with correct torque wrenches.

d. Excessive worm shaft end play in connector assembly. Replace worm and connector as an assembly. (Part No. 1670687).

If steering wheel freeplay does not exceed

5/8 inch, it is an indication that the difficulty is caused by one of following:

a. Steering gear arm nut loose on gear shaft. Tighten 120 foot-pounds torque.

b. Loose front wheel bearings. Adjust.

c. Steering linkage. Check for worn or loose tie rod ends, loose steering knuckle arms, drag links, etc. Tighten or replace necessary parts to eliminate freeplay.

d. Front wheel alignment. Align front wheel.

59. POOR RETURNABILITY (BOTH DIRECTIONS)

This is a condition whereby front wheels will not return to straight ahead position without assistance of operator. A primary cause of this condition is often due to low tire pressure, therefore, prior to checking further, inflate tires to proper pressure and road test. If condition exists, check returnability of power unit as follows to determine if condition is caused by power unit or front wheel alignment.

Disconnect linkage from steering gear arm and start engine. With engine idling, use torque wrench on steering gear arm nut and check torque required to turn gear shaft through center from one extreme to other.

The torque reading should be approximately equal in each direction and should not exceed 40 foot-pounds, + or — 10 pounds. If torque reading does not exceed 40 foot-pounds + or — 10 pounds, it is an indication that difficulty is caused by one of following and not power steering unit:

a. Check all tie rod ends, steering knuckles for binding. If a bind is found to exist in any of these parts, replace as necessary.

b. Front wheel alignment. Align front wheels.

If torque readings exceed 40 foot-pounds, + or — 10 pounds in either direction, it is an indication that the condition is caused by the power steering unit. To determine an exact source, it will be necessary to start engine and recheck amount of torque required to turn gear shaft each time one of following items is checked.

c. Steering wheel to column jacket interference. Adjust to give necessary clearance.

d. Steering column jacket bearing. Remove steering wheel, with puller, Tool C-3428, jacket and shroud assembly and steering tube. Recheck torque, if reading is 40 foot-pounds or below, the difficulty is caused by steering column jacket bearings, replace bearings. If reading was not below 40 foot-pounds, proceed as follows:

e. Gear shaft adjustment too tight. Adjust gear shaft.

f. Worm bearing preload too tight. Place unit in special holding fixture Tool C-3323, connect test hoses and refill reservoir. Remove worm shaft oil seal. Start engine and recheck torque reading. If torque reading remains above 40 foot-pounds, check worm bearing preload for being too tight.

Readjust preload. If reading still remains above 40 foot-pounds, proceed as follows:

g. Worm shaft binding in connector. Remove upper housing and using Tool C-3469, secure housing head. Start engine and recheck torque reading. If reading is 40 foot-pounds or below, difficulty is due to either worm shaft binding in connector or connector guide rails binding on housing. Inspect and replace necessary parts.

60. POOR RETURNABILITY (ONE DIRECTION ONLY)

This is a condition whereby front wheels will not return to straight ahead position without assistance of operator. A primary cause of this condition is often due to low tire pressure, therefore, prior to checking further, inflate tires to proper pressure and road test. If condition still exists, check returnability of power unit as follows to determine if condition is caused by power unit or front wheel alignment:

a. Disconnect linkage from steering gear arm and start engine.

b. With engine idling, use a torque wrench on steering gear arm nut, and check torque required to turn gear shaft through center from one extreme to other. The readings should be approximately equal and not exceed 40 foot-pounds, then difficulty is caused by front wheel alignment and not power unit.

c. Align front wheels. If this does not correct condition, proceed as follows:

d. Center the control valve until equal torque readings are obtained in each direction.

61. UNEQUAL STEERING EFFORT (SEVERE CASES OF SELF STEERING)

A condition whereby operator finds that it takes very little effort to turn steering wheel in one direction, while considerable force is required, in the opposite. In severe cases of unequal steering effort it is possible that vehicle will have a tendency to self steer unless steering wheel is held.

Unequal steering effort is often mistaken for "lack of assist in one direction," and since causes for each are entirely different, make sure difficulty is diagnosed properly before attempting to correct. To establish which condition exists, check turning effort of steering wheel as follows:

a. With engine idling and front wheels resting on floor, turn steering wheel at normal rate of r.p.m. from one extreme to other, noting amount of turning force required. Turn steering wheel in same manner except at much higher rate of r.p.m. and again noting amount of turning force required.

CAUTION

Do not exceed 60 steering wheel r.p.m.'s when making this check.

If turning force did increase considerably with higher rate of steering wheel r.p.m.'s, then refer to "lack of assist" (one direction). If amount of turning force did not increase appreciably with increased steering wheel r.p.m. then it is reasonable to assume that condition is unequal steering effort. Proceed as follows:

b. Disassemble unit as required.

62. CONTROL VALVE ADJUSTMENT

Disconnect linkage and center control valve so that an equal amount of torque is required to turn gearshaft from one extreme to other. If proper adjustment cannot be maintained after it has been set, then refer to "INABILITY TO MAINTAIN CONTROL VALVE ADJUSTMENT", Paragraph 71.

63. UPPER PISTON ROD MOVEMENT IN PISTON

Check fit of snap ring which retains upper piston rod in piston, by attempting to rotate it. If snap ring can be rotated, it will allow upper piston rod to move axially with respect to piston thus displacing control valve in relation to valve body. This can cause self steering in either direction; however, it is usually most noted to be to the left. To correct, replace piston making sure snap ring seats properly.

64. CONNECTOR NUT

Anything which will cause valve rod adjusting disc to be loose in connector, will result in self steering. Check for connector nut not tightened sufficiently to lock valve rod adjusting disc and reaction assembly in connector. To accomplish this, remove worm connector and reaction assemblies from upper piston rod. Reassemble by placing the adjusting disc, adjusting disc retainer and valve control spacer in their respective positions in worm connector. Install worm connector nut and tighten securely. Insert small punch or screw driver through bottom of connector and attempt to rotate adjusting disc. If it cannot be rotated, it is properly locked.

65. CONTROL VALVE LOOSE ON ROD

The control valve rod is connected to control valve by peening. Check for any movement between the two. If movement exists, replace control valve and rod. Do not attempt to tighten by peening.

66. UPPER PISTON ROD NUT LOOSE

Tighten to proper torque.

67. UPPER PISTON ROD

Inspect upper piston rod for being scored at reaction seal retainer bearing surfaces and replace if needed.

68. REACTION ASSEMBLY

If above mentioned items have failed to correct unequal steering effort, replace all reaction parts. Make definitely sure valve control spacer is matched to upper piston rod. The length of valve control spacer must be identical to dis-

tance between the seat of lower valve control spacer retainer and the seated upper piston rod nut.

69. INABILITY TO MAINTAIN CONTROL VALVE ADJUSTMENT

This condition can be caused by one of the following: Reaction spacer being too long, too short, or by burrs, or out of squareness of any reaction area parts which are held inside connector by connector nut, including nut. Anything which causes unseating of reaction retainers when no turning force is applied will make accurate valve adjustment impossible. This can also be caused by one of following:

a. Valve control rod loose in nut valve rod adjusting cap assembly. Replace the valve rod adjusting assembly as required.

CAUTION

The turning torque for valve control rod in threads of valve rod adjusting disc should be 10-12 inch pounds to prevent any looseness at this point. Do not exceed 20 inch-pounds, otherwise damage to valve rod and/or adjusting tool may result.

b. Upper piston rod nut loose. Tighten to proper torque.

c. Control valve loose on rod. The control valve rod is connected to control valve by peening. Check for any movement between the two. If movement exists, replace control valve and rod. Do not attempt to tighten by peening.

d. Upper piston rod loose in piston. Check for movement of upper piston rod in piston. If movement exists, replace piston.

70. LACK OF ASSIST (ONE DIRECTION)

This is a condition whereby operator finds that considerable more effort is required to turn steering wheel in one direction than it does the other. Since lack of assist in one direction is often mistaken for "Unequal Steering Effort" and causes for each are entirely different, make sure difficulty is properly diagnosed before attempting to correct. To determine which condition exists, refer to "Unequal Steering Effort" for method of establishing. Lack of assist in one direction usually is found to be caused by one of following.

a. Piston Ring (Neoprene). Check for damaged neoprene piston ring.

b. Housing Head Oil Seal Upper Piston Rod. A damaged or improperly seated housing head oil seal will cause lack of assist when turning to left, and will also be accompanied by loss of oil out vent in upper housing. Inspect sealing surface on upper piston rod for being scratched. Replace if necessary. Install new housing head oil seal making sure it is properly seated in housing head.

c. Lower Piston Rod Oil Seal. A damaged or improperly seated lower piston rod oil seal will cause lack of assist when turning to right. Inspect sealing surface on lower piston rod for being scratched. Replace if necessary. Install new lower piston rod oil seal making sure it is properly seated in housing.

d. Valve Rod Lower "O" Ring. Inspect for damaged lower valve rod "O" ring in upper piston rod. Inspect groove for any foreign matter. Install new "O" ring making sure it is seated properly in groove.

e. Piston Rod "O" Rings. Inspect for damaged "O" rings on both upper and lower piston rods which may be causing leakage between piston and rods. Install new "O" rings making sure they fit properly in grooves.

71. LACK OF ASSIST (BOTH DIRECTIONS)

This is a condition whereby operator notes that considerable amount of effort is required to turn steering wheel in both directions. To locate cause of condition, check following possibilities in manner in which listed:

a. Tire pressure too low. Inflate to proper pressure.

b. Pump Drive Belt slipping or broken. Adjust belts to proper tension, or replace if needed.

CAUTION

Where two belts are used, make definitely sure both top and bottom belts are adjusted, otherwise condition will remain.

c. Low fluid level. Fill reservoir to proper level.

d. Should lack of assist still be encountered, a pressure check should be made to determine if pump is at fault.

DIAGNOSIS OF PUMP TROUBLE

COXIAL POWER STEERING GEAR (Continued)

72. PUMP NOT PRIMING

a. Weak or broken plunger spring (compressed to a height of $^{61}/_{64}$ inch, the spring should exert a force of 29.7 to 36.3 pounds when compressed).

b. Flow valve stuck in open position. Check for dirt or burrs on flow spool or in valve liner.

73. REDUCED OR NO FLOW

a. Flow valve stuck in open position—check for dirt or burrs on flow spool or in valve liner.

b. Relief valve leaking—check for dirt or nicks on relief valve seat.

c. Weak or broken relief valve spring—when compressed to a height of $^{35}/_{64}$ inch, the spring should exert a force of 12.5 to 14 pounds when compressed.

d. Flow valve spring retainer loose, torque to maximum specifications.

e. Cap screws on either end of pump loose—torque to indicated specifications.

f. Weak or broken flow valve spring—when compressed to a height of 1½ inch, the spring should exert a force of 11.25 to 13.75 pounds when compressed.

74. LOW SHUT-OFF OR RELIEF PRESSURE

a. Weak or broken relief valve spring—replace.

b. Leak in relief valve—check for dirt or nicks on relief valve seat.

c. Flow valve stuck in open position—check for dirt or burrs on flow spool or in flow valve liner.

d. Cap screws on either end of pump loose—torque to indicated specifications.

75. PUMP NOISE

a. Check oil level in reservoir—oil level should be up to mark on filler neck when pump is at 175° F.

b. Air in steering system—check all connections to make certain that they are tight.

c. Discharge and return line hoses—the hoses must not touch any part of the body or frame except where they are attached to the pump or steering column.

d. Loose pulley.

e. Water in oil.

76. HARD OR JERKY STEERING TOWARD END OF FULL LEFT OR RIGHT TURN

a. Loose drive belt—tighten drive belts to specified torque.

77. OIL LEVEL IN THE RESERVOIR

The following precautions should be observed for best performance of the sleeve-type power steering pump.

The oil level in reservoir will vary according to the operating temperature. The normal operating temperature of the pump is approximately 175° F. At this temperature, the oil should be up to the oil level mark on the filler neck. At 70° F. the oil will be approximately 3¼ inches from top of the filler neck.

NOTE: The oil level should never be allowed to fall below the baffle in the reservoir.

Automatic Transmission Fluid Type "A" is used in the steering system; however, S.A.E. 10W may be used to bring the oil level to the proper place if the level is low. If the steering system is drained, it should be filled with transmission fluid. The pump must be full before the engine is started. After starting the engine, add sufficient oil to make-up for the pump consumption to bring oil up to operating level.

78. BELT TENSION

The belt tension may be checked by applying torque wrench to the bolt which holds the pulley in place. Turning in the direction which will tighten the bolt, the torque should be 20 foot-pounds.

Section XI

TRANSMISSION

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STANDARD 3-SPEED

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Section XI
TRANSMISSION
STANDARD 3-SPEED

The new Chrysler three-speed synchomesh manual Transmission has been modified to include a simplified gear shift mechanism, low and reverse sliding gear and a new set of gear ratio to improve acceleration and increase the service life of the transmission. The Standard Transmission is of the synchromesh type and the gears are helically cut to provide silent operation. The counter-shaft gears are in constant mesh, assuring smooth, silent shifting in second and high gear.

SERVICE PROCEDURES

1. DISASSEMBLY

a. Removal From Vehicle

Drain lubricant from transmission. Disconnect the propeller shaft, speedometer cable and housing and gearshift control rods. Remove back-up light switch (if vehicle is so equipped) and speedometer drive pinion. If mainshaft is to be removed or rear oil seal is to be replaced, apply the hand brake to hold mainshaft while loosening the flange nut or use flange holding wrench, Tool C-3281. This method will also prevent possible brinelling of bearings, or other damage caused by pounding on the wrench. Remove flange nut and washer. Disconnect hand brake cable. Remove brake drum and flange assembly, using puller Tool C-452. Remove oil seal with puller, Tool C-748. Pull transmission straight back until pinion shaft clears clutch disc before lowering transmission. This precaution will avoid bending the clutch disc.

b. Gearshift Housing (Fig. 1)

Remove six bolts holding gearshift housing to transmission case, remove housing and discard gasket. Remove shift forks from transmission case (if not removed with housing). Remove operating levers from their respective shafts. Drive out retaining pin from either one of two lever shafts and withdraw lever from housing.

CAUTION

Interlock balls are spring loaded.

Remove interlock sleeve, spring, pin and re-

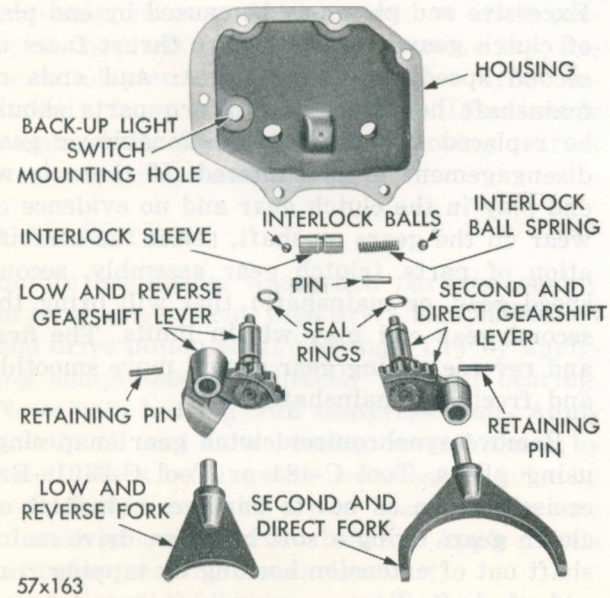


Fig. 1—Gear Shift Housing—Disassembled View

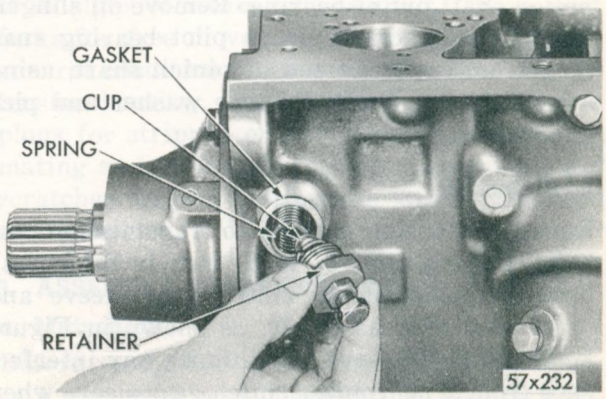


Fig. 2—Transmission Assembly Mounted on Holding Fixture

maining interlock ball. Remove remaining operating shaft, after driving out retaining pin. Remove "O" type seal ring from each operating shaft and discard. Do not remove steel expansion plug from side of gearshift housing unless there is evidence of leaking.

c. Drive Pinion

Remove main drive pinion bearing retainer and discard gasket. **Do not remove drive pinion shaft assembly at this time.** Loosen, but do not remove transmission case to extension bolts. Reinstall brake drum and flange assembly, place transmission assembly on mounting fixture, as shown in Figure 2.

NOTE: As the transmission will be partially disassembled and assembled, while mounted in a vertical position; it will be necessary to provide a suitable mounting fixture. A suggested mounting fixture consists of a wood or steel block (Fig. 2) approximately 8 inches square with holes drilled to receive the four studs of the brake drum and flange assembly. To provide additional stability additional holes may be drilled in the mounting fixture for attachment to repair stand, Tool DD-1014 (with adapter arms, C-3304).

Remove drive pinion shaft assembly by lifting upward on shaft (Fig. 2). It may be necessary to tap shaft lightly to aid in its removal.

NOTE: Complete the following only if condition of the large ball bearing or pilot bearing rollers warrant their removal.

Remove snap ring (small) which locks main drive pinion bearing in position on shaft. Remove pinion bearing in position on shaft. Remove pinion bearing washer, carefully press pinion shaft out of bearing. Remove oil slinger. Remove main drive pinion pilot bearing snap ring from cavity in end of pinion shaft, using a hook or flat blade. Remove washer and pick out rollers.

d. Mainshaft

Remove extension housing to transmission case bolts. Place a nut (½ to ⅝ inch in thickness) between synchronizer clutch gear sleeve and inner stop ring assembly, as shown in Figure 3. The nut will serve to minimize any interference from synchronizer clutch gear sleeve when transmission case is removed from extension housing assembly.

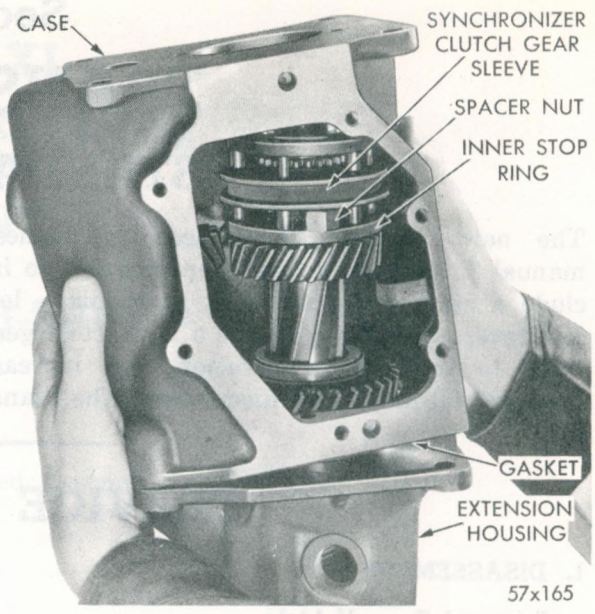


Fig. 3—Removing Transmission from Extension Housing

Remove transmission case by lifting upward while guiding cluster gear second speed gear past synchronizer sleeve (Fig. 3). Remove extension housing assembly from mounting fixture. There should be no end play of synchronizer clutch gear on mainshaft. If end play is present, select one of four snap rings to eliminate all end play. (Refer to Paragraph 3). Pointed ends of clutch teeth must retain their original contour to allow proper synchronization. Check end play of second speed gear. More than .008 inch end play may result in noise. Excessive end play may be caused by end play of clutch gear or wear on the thrust faces of second speed gear, clutch gear and ends of mainshaft helical splines. Worn parts should be replaced if noise is objectionable or gear disengagement is encountered. If there is no end play in the clutch gear and no evidence of wear on the gears or shaft, select the combination of parts (clutch gear assembly, second speed gear, or mainshaft) that will bring the second gear end play within limits. The first and reverse sliding gear should move smoothly and freely on mainshaft.

Remove synchronizer clutch gear snap ring, using pliers, Tool C-484 or Tool C-3301. Exercise care so as not to damage mainshaft or clutch gear. Using a soft hammer, drive mainshaft out of extension housing by tapping rear end of shaft. Remove mainshaft rear bearing retaining snap ring.

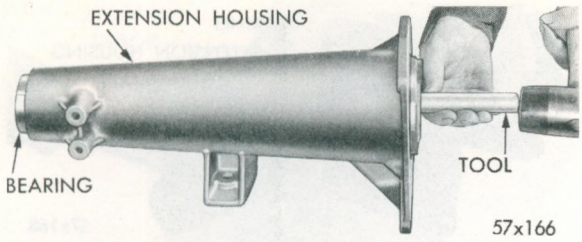


Fig. 4—Removing Extension Housing Rear Bearing

NOTE: If condition of needle and ball bearings warrant their removal proceed as follows:

Remove needle bearing using Tool C-3275 by driving bearing **into** extension housing. With needle bearing laying in extension housing, drive ball bearing out of its bore, using driver, Tool C-3275 as shown in Figure 4. Needle bearing can now be removed through rear of extension housing.

e. Reverse Idler

Using a suitable brass drift, drive reverse idler gear shaft towards rear of transmission case. Remove locking key from keyway. Finish driving out of shaft and lift out reverse idler gear and bearing assembly.

f. Countershaft

Check end play of the countershaft (.004-.012 inch permissible end play—refer to Paragraph 3), to determine need for new thrust washers at assembly. Using adapter arbor, Tool C-578, drive countershaft toward rear and out of transmission case. A key at end of shaft prevents the shaft from turning. Remove key. Remove adapter shaft (with adapter arbor installed) from transmission case. Disassemble countershaft assembly by removing thrust washers, rollers and spacer.

2. INSPECTION

Before inspecting, wash each part thoroughly in a suitable solvent, then dry. Clean mainshaft and drive pinion shaft bearings. Dry by applying compressed air directly through bearing. **Never spin bearing with compressed air. Apply a little oil and turn bearing several times by hand.** Check bearings for looseness or noise by comparing them with a new bearing. (Be sure to wash grease from new bearing. Apply a little oil before making comparison test).

Inspect fit of bearings on their respective shafts and in bores. Inspect bearings, shaft, and case for wear. If installation of a new bearing does not correct condition, install a new shaft or case.

Inspect mainshaft splines for galling or scoring. Inspect bearing mounting surfaces and snap ring grooves. Slight nicks or burrs can be stoned off. Replace damaged parts. Inspect the gear teeth and threads on inner and outer synchronizer stop rings. Check gear teeth on clutch gear sleeve.

If there is evidence of chipped or excessively worn gear teeth, replace the part. Make sure synchronizer clutch sleeve slides freely on clutch gear. Check pins of inner and outer synchronizer stop ring assembly for straightness and looseness. The pins should be 1.570 to 1.580 inches long. If pins do not comply with this specification, replace synchronizer stop ring assemblies.

Replace countershaft gear cluster, if any of its gear teeth are broken, chipped or excessively worn. Small nicks or burrs can be stoned off. Check rollers for chips and nicks. Replace all rollers if any one is damaged. Check condition of thrust washers, and replace if excessive wear is evident. Inspect the clutch teeth of the drive pinion. If they are excessively worn, broken, or chipped, install a new pinion shaft. Inspect mainshaft pilot rollers for pitting or scoring. If any of these conditions exist, replace all roller bearings.

If roller bearings fall out during disassembly, they are too loose and should be replaced. Inspect gearshift housing and operating levers. Replace rubber grommets in operating levers, if worn or torn. Check interlock sleeve for free movement in its bore. Examine interlock balls for corrosion. If operating lever shaft detents show signs of wear, replace shaft. Check shift forks for free movement in shaft lever. Check general condition of transmission case and extension housing. Check all threaded holes and plugs for stripped or pulled threads. Check all mating and gasket surfaces for roughness and scratches. Inspect castings for small cracks and sand holes.

3. ASSEMBLY OF TRANSMISSION

a. Mainshaft

Before assembling the transmission, lubricate each part with clean S.A.E. 80 lubricant. Drive mainshaft rear bearing (ball) into bore at rear of extension housing using driver, Tool

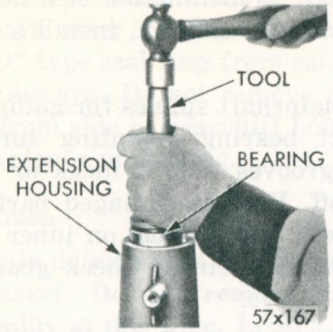


Fig. 5—Installing Extension Housing Rear Bearing

C-3204, as shown in Figure 5 until bearing is seated against shoulder in extension housing. Select and install snap ring to eliminate all end play at bearing. Snap rings are available in two sizes. **Make sure snap ring seats properly.** Place needle bearing on extension (Fig. 6) and carefully press (on lettered side of bearing) using a suitable arbor press. Press until bearing is flush with face of extension.

Using driver, Tool C-3105, install oil seal, driving until tool bottoms on extension housing. Position mainshaft into extension housing and tap forward end of mainshaft, using a soft hammer (Fig. 7), until shoulder at rear of mainshaft seats firmly against inner race of rear bearing (ball).

Install brake drum and flange assembly on mainshaft, place mainshaft and extension housing assembly on mounting fixture. Place first and reverse sliding gear on mainshaft with fork collar facing up. Install second speed gear, place spreader spring and then synchronizer inner stop ring on second speed gear.

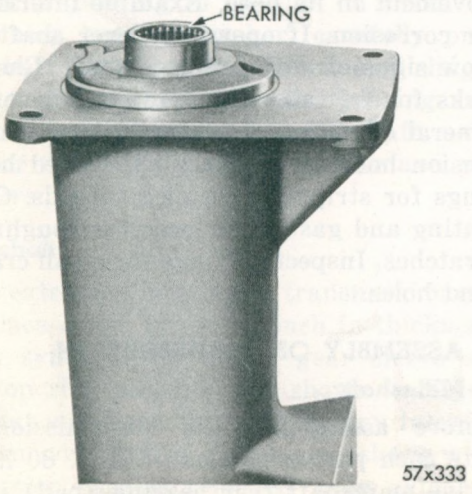


Fig. 6—Positioning Bearing for Installation

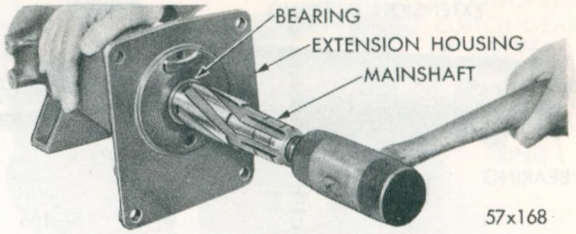


Fig. 7—Installing Mainshaft in Extension Housing

NOTE: Lightly grease threads on stop ring to provide lubrication during initial application of synchronizer assembly.

Install synchronizer clutch gear on mainshaft and secure in place with one of four available snap rings to eliminate all end play at clutch gear. Snap rings are available in the following sizes: (thin) .086-.088 inch, (med.) .089-.091 inch; (thick) .092-.094 inch; (x-thick) .095-.097 inch. Install snap ring. Make sure snap ring is properly seated. Place balance of synchronizer assembly on mainshaft. (Fig. 8). **Be sure to apply a light film of grease to outer stop ring.**

b. Reverse Idler Gear

Insert adapter arbor (Fig. 9) into reverse idler gear, then place the 22 rollers in position in gear.

NOTE: A suitable adapter arbor, for assembling the reverse idler gear assembly, can be made of either wood or metal by turning and cutting the stock to a length of 1.0625 inches and a diameter of .750 inch. (¾ inch dowel stock should prove satisfactory).

Install thrust washer at each end of adapter arbor. Place small amount of grease on thrust washers to hold in place during installation of

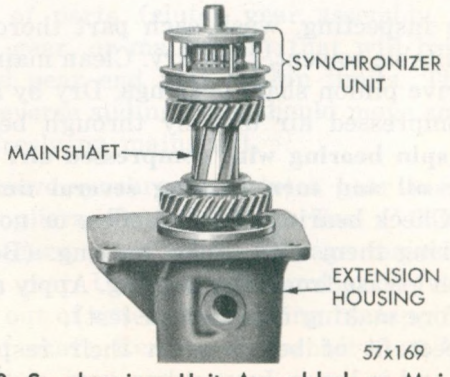


Fig. 8—Synchronizer Unit Assembled on Mainshaft

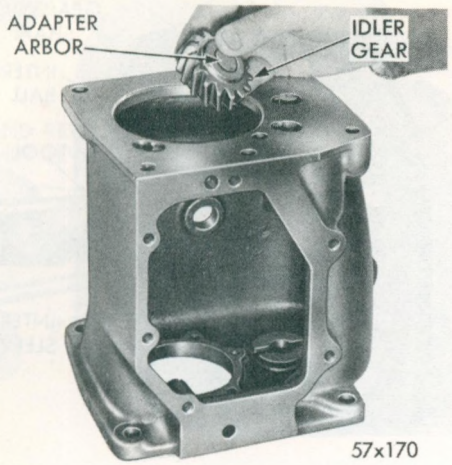


Fig. 9—Installing Reverse Idler Gear

gear in case. Place reverse idler assembly into transmission case (pointed end of teeth forward), as shown in Figure 9. Remove adapter arbor by driving reverse idler gear shaft through idler gear until key can be installed. Install key. Continue to drive shaft into case until shaft is approximately 1/64 inch below mating surface on transmission case.

c. Countershaft

Insert adapter arbor, Tool C-578 into countershaft gear. Place spacer over adapter arbor and insert into cluster gear. After installing the 22 bearing rollers (on one end), place small thrust washer against end of rollers. Install remaining rollers (22) at opposite end of countershaft. Place remaining small thrust washer next to rollers. Add small amount of grease to hold small thrust washers in place.

Fig. 10—Installing Counterweight Thrust Washer

Do not install large tabbed thrust washers at this time.

Be sure transmission case is resting on smooth surface, then position countershaft assembly into transmission case allowing adapter arbor to enter cluster gear shaft hole in rear of case. Install one of the large tabbed thrust washers (Fig. 10), making sure tab on washer engages groove in case. Washers are available in two sizes marked A and B. Select one to give .004 to .012 inch total end play of countershaft. Slide transmission case to edge of bench to permit adapter arbor to be pushed (with the finger) into countershaft hole in front of transmission case. Rotate case 180 degrees and install remaining large thrust washer in like manner. **Make sure tab engages groove in case.**

Using cluster gear shaft, push adapter arbor from cluster gear until shaft key can be inserted. Continue to drive shaft into case until it is approximately 1/64 inch below mating surface on rear of transmission case. Lightly grease gasket surface of extension housing and install gasket. Install transmission case to extension housing assembly, as shown in Figure 3.

NOTE: To minimize interference from synchronizer clutch gear sleeve, when transmission case is placed on extension housing, place a nut (1/2 to 5/8 inch thick) between clutch gear sleeve and inner stop ring, as shown in Figure 3.

Install extension housing to case studs and bolts and **tighten finger** tight only.

d. Drive Pinion

Place oil slinger, if removed, on pinion shaft. (Fig. 11). Press pinion shaft into ball bearing.

CAUTION

Make definitely sure slinger does not "hang-up" in bearing snap-ring groove during pressing operation.

Install keyed washer and secure with snap ring to eliminate all end play. Four snap rings are available (same sizes as synchronizer clutch gear snap ring). **Make sure snap ring is properly seated.** If the large snap ring on main drive pinion bearing was removed, replace at this time. Place shaft in vise equipped with soft jaws, and place 14 rollers in place in pilot pocket of drive pinion. Install washer against ends of rollers. Install snap ring.

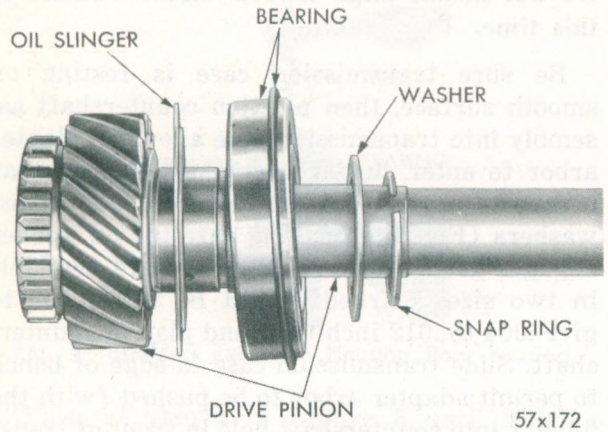


Fig. 11—Positioning Oil Slinger

CAUTION

Remove the ½ to ⅝ inch nut from synchronizer clutch gear sleeve and inner stop ring (if not done so previously). Guide drive pinion shaft through front of case, engaging synchronizer outer stop ring with clutch gear on drive pinion. Pinion shaft bearing is fully seated when snap ring makes full contact with face of transmission case.

Slide pinion bearing retainer over pinion shaft and against transmission case. While holding retainer with hand pressure against transmission case, measure the clearance between retainer and case, using a feeler gauge. Select a gasket about .005 inch thicker (consult parts catalog for sizes) than the clearance (to eliminate end play on front bearing) and install retainer and tighten bolts.

Remove transmission assembly from mounting fixture and tighten bearing retainer screws to 15 foot-pounds torque and extension to case bolts 30 foot-pounds torque. Install mainshaft washer (convex side towards nut) and draw

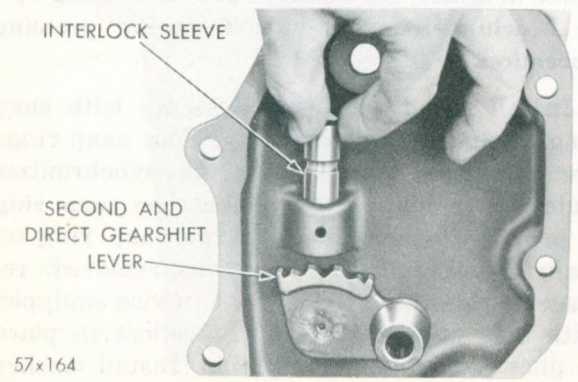
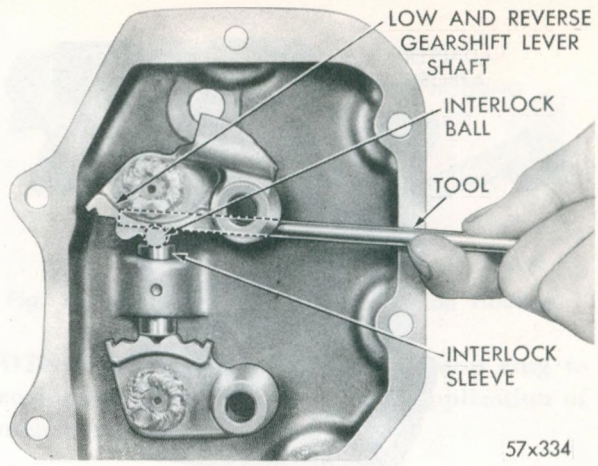


Fig. 12—Installing Interlock Sleeve



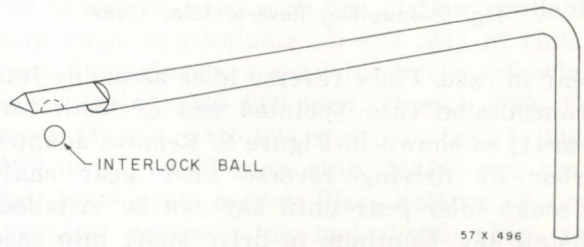


Fig. 13—Depressing Interlock Ball—Using Suggested Tool

nut up snug against washer. Install lubricant drain plug and tighten 20 foot-pounds torque.

e. Gearshift Housing (Refer to Fig. 1)

Place gearshift housing in vise (equipped with soft jaws) (Fig. 12). Place "O" ring seal on second and direct gearshift lever shaft and install lever shaft in housing. Secure shaft in place with retaining pin. Install interlock sleeve in its bore, as shown in Figure 12. Place one of the interlock balls in sleeve followed by interlock ball spring, and pin.

Place low and reverse gearshift lever shaft (part way) into its bore after installing "O" ring seal on shaft. Place second interlock ball on top of interlock ball spring. While depressing ball with the suggested tool, as shown in Figure 13, rotate tool 90° and engage with low and reverse gearshift lever cam by completely seating shaft in bore while allowing interlock ball to seat in detent of lever, as shown in Figure 14.

NOTE: A suggested tool for depressing and engaging the interlock ball consists of bending and finishing a piece of ¼ inch drill rod, as shown in the section accompaning Figure 13.

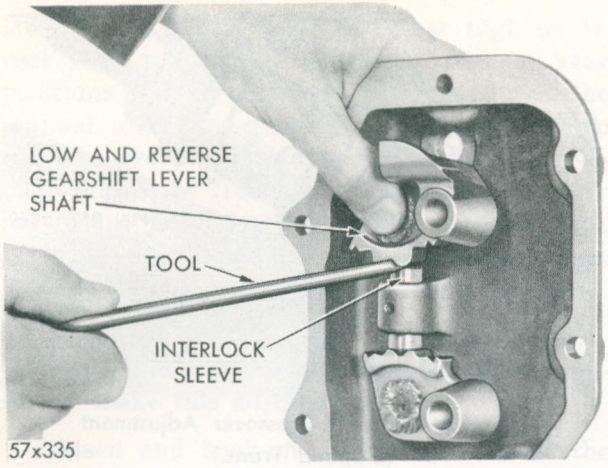


Fig. 14—Engaging Low and Reverse Gearshift Lever Shaft Ball with Interlock

Secure shaft with retaining pin, as shown in Figure 15.

NOTE: Lever shaft detents must be placed in neutral position to allow clearance for tool.

Install the gearshift operating levers and tighten retaining nuts to 20 foot-pounds torque. Shift transmission into neutral and place shift forks in position in transmission case, as shown in Figure 16. Place operating levers in gearshift housing in neutral position.

Place gasket on transmission case to gearshift housing mating surface and install gearshift housing by engaging shift fork ends with their respective operating lever shafts. Tighten gearshift housing bolts to 20 foot-pounds torque.

Install a new steel expansion plug (if removed) in side of gearshift housing. Install back-up light switch (if so equipped) and speedometer drive pinion. Check operation of gearshift housing.

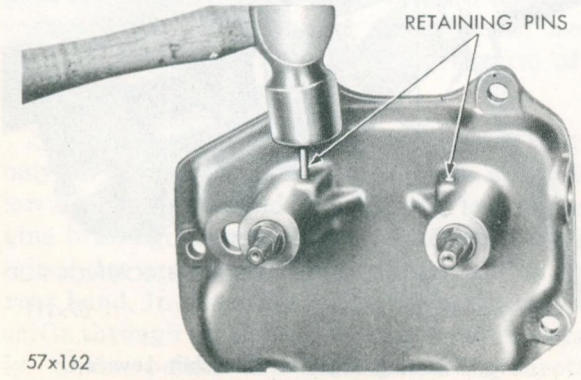


Fig. 15—Driving Retaining Pin into Position

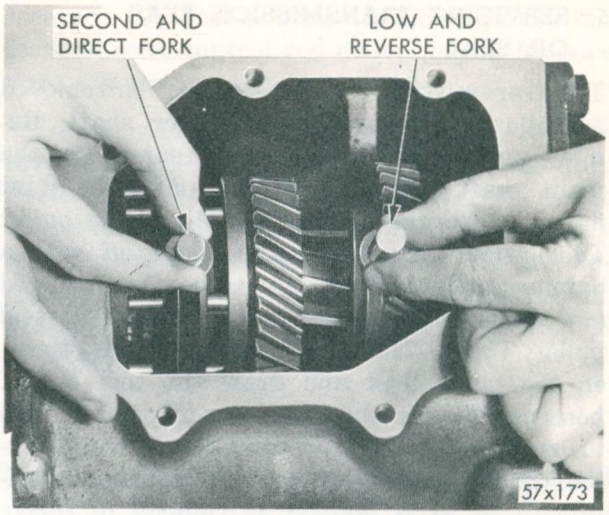


Fig. 16—Installing Shift Forks

NOTE: The transmission case is not equipped with back-up light switch, install plug and tighten to 15 foot-pounds torque.

4. INSTALLATION

If transmission has been jumping out of gear, check clutch housing bore and face alignment with housing aligning arbor, Tool C-870, before installing transmission in car. Refer to Clutch, Section IV of this manual for procedures outlining clutch housing alignment.

Installing Transmission

Insert about ½ teaspoonful of short-fibre wheel bearing grease behind radius in the drive pinion pilot bushing in end of crankshaft. Do not put grease on end of drive pinion. Be careful not to get any grease on clutch facing or flywheel, this will cause clutch disc slippage and chattering. Be sure clutch disc is properly aligned.

NOTE: An old transmission drive pinion shaft may be used to check clutch disc alignment.

Use extreme care when installing the transmission to avoid springing the clutch disc. Tighten transmission case to clutch housing bolts to 50 foot-pounds torque. Tighten the mainshaft flange nut to 150 foot-pounds torque using the hand brake to facilitate the operation, or wrench, Tool C-3281. Always check clutch pedal adjustment after installing transmission. Adjust the shifting linkage with the transmission in the neutral position.

5. SERVICING TRANSMISSION REAR OIL SEAL

The transmission rear oil seal can be removed as follows: Remove the propeller shaft. Remove nut and washer from the rear end of the main shaft and pull off the universal joint flange and brake drum assembly. Using puller Tool C-452, never drive the flange off with a hammer as mainshaft splines may be damaged and drum made out-of-round. Insert oil seal puller, Tool C-748 into the seal securely, tighten the puller bolt and draw the seal out of housing. When installing a new oil seal, be sure to use special driver, Tool C-3105, which automatically locates the seal in its proper position.

Reinstall brake drum and flange assembly. Install washer (convex side towards nut). Tighten nut to 150 foot-pounds torque. Reconnect propeller shaft and tighten nuts securely.

6. GEARSHIFT CONTROL ADJUSTMENTS (Fig. 17).

a. Crossover Adjustment

Before making the crossover adjustment the **gearshift lever shaft must be in its normal fully returned position in neutral.** After removing lubrication fitting (Fig. 17) from the tube lever pin retainer, rotate retainer until gearshift tube cross pin is exposed (Fig. 18). If a .040 inch feeler (round) gauge cannot be inserted between the gearshift tube cross pin and the bottom of the slot in second—direct shift lever hub, as shown in Figure 18, an adjustment at

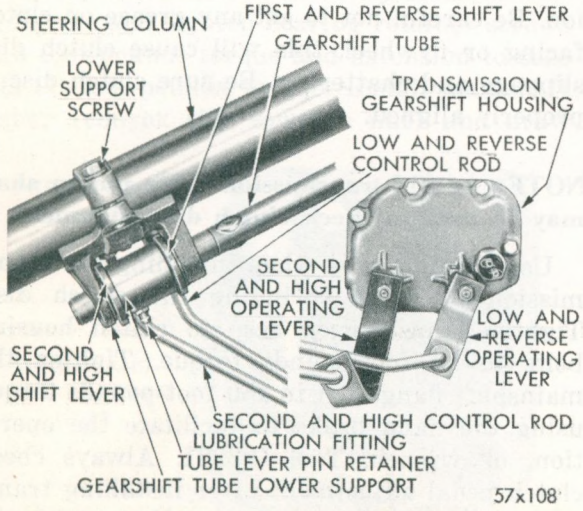


Fig. 17—Gearshift Control Adjustment 3-Speed Transmission

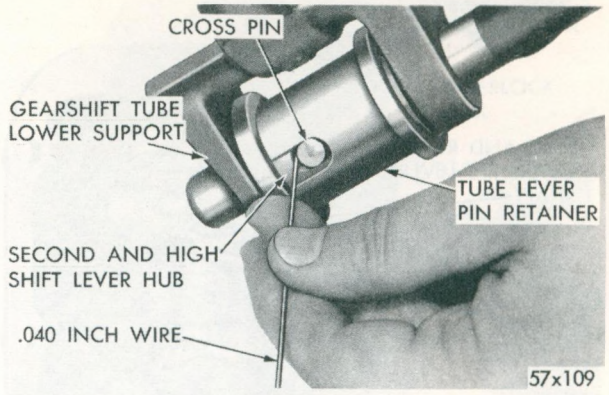


Fig. 18—Gearshift Crossover Adjustment (3-Speed Trans.)

gearshift tube lower support must be made as follows.

Loosen gearshift tube lower support screws sufficiently to permit movement of the support when support is tapped lightly with a plastic hammer. Adjust support up or down, as required, to secure the necessary .040 inch clearance. Tighten support clamping screws to 150 inch-pounds torque (90 inch-pounds for power steering equipped units). Rotate tube lever pin retainer to original position and install lube fitting.

CAUTION

Be sure lubricant fitting is securely tightened 70 inch-pounds torque. Failure to reinstall or loss of fitting will permit tube lever pin retainer to rotate resulting in loss of gearshift tube cross pin.

After completing adjustment, approximately equal up and down free travel of the gearshift

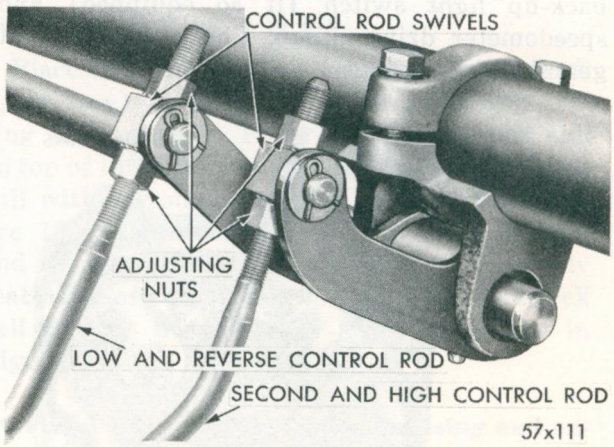


Fig. 19—Aligning the Gearshift Levers (3-Speed Trans.)

lever should be provided in either high or direct gear positions and low or reverse gear positions. Check crossover adjustment, at the manual lever, by making the crossover from second-direct to low-reverse. Crossover movement should be free of interference. Crossover movement from low-reverse to second-direct, likewise, should also be free of interference.

b. Control Rod Adjustment

Transmission must be in neutral before attempting to make this adjustment.

Loosen and back-off adjusting nuts at the second-direct gearshift control rod swivel (Fig. 19). Turn both adjusting nuts in direction required to locate knob end of lever (in vehicle) in a horizontal plane (sighting through rear window of vehicle will aid in determining horizontal plane of lever). Tighten adjusting nuts securely (70 foot-pounds torque) against the second-direct control rod swivel block. **Be sure transmission remains in neutral.**

Loosen and back-off adjusting nuts at low-reverse gearshift control rod swivel (Fig. 19). Position low-reverse gearshift lever in direct alignment (through center of swivel block pin) with second-direct gearshift lever. Tighten adjusting nuts securely (70 foot-pounds torque) against swivel block. **DO NOT LUBRICATE SWIVEL BLOCKS.**

CAUTION

Failure to make this adjustment correctly will result in insufficient manual lever to steering column clearance or manual lever to operator's leg clearance. Damage to transmission assembly is also a possibility because of incomplete engagement of gears.

TORQUEFLITE TRANSMISSION

The TorqueFlite Transmission (Fig. 20) combines a wide range torque converter and an automatic planetary gear box. The torque converter extends torque multiplication (2.7 at stall) over a wide range of engine speeds. The transmission consists of two multiple disc clutches, an overrunning clutch, two bands, and two planetary gear sets to provide three forward ratios and a reverse ratio.

With the front or forward clutch engaged and low gear reaction, transferred through the transmission overrunning clutch assembly, a low ratio of 2.45 to 1 is obtained. Engagement of kickdown or second speed band will shift the transmission to second speed ratio of 1.45 to 1. Disengagement of the kickdown band and engagement of the rear or direct clutch locks the gear set so that a direct drive ratio of 1 to 1 is obtained.

Since overrunning clutch can transmit torque only on drive side, it is necessary to apply the low and reverse band when using low for engine braking. Reverse ratio of 2.20 to 1 is obtained by application of the rear clutch and rear band. In the drive range, the transmission shifts through all three gear ratios automatically. Shifts points are determined by throttle opening and car speed.

If additional acceleration is desired while in drive range, the transmission will downshift (depending on vehicle speed) to second gear or breakaway automatically when the accelerator pedal is completely depressed.

The intermediate or second position range is used to operate transmission in the first two gears only. This range is suitable for heavy city traffic where the driver may desire part throttle second gear operation for more precise speed control. It may also be used on long down grades where additional engine braking is needed. A low or first position range is also available to keep the transmission in first gear only. This position provides added handling ease in mountain driving and exceptional pulling qualities in sand and snow.

7. GEARSHIFT CONTROL UNIT

The transmission is operated by a gearshift control unit consisting of five push buttons, identified by R (reverse), N (neutral), D (drive), 2 (second) and L (low). (Fig. 21).

The control unit is located on the instrument panel to the left of the steering column. Range selection is made by pushing the proper button.

Should the R (reverse) button be pushed in,

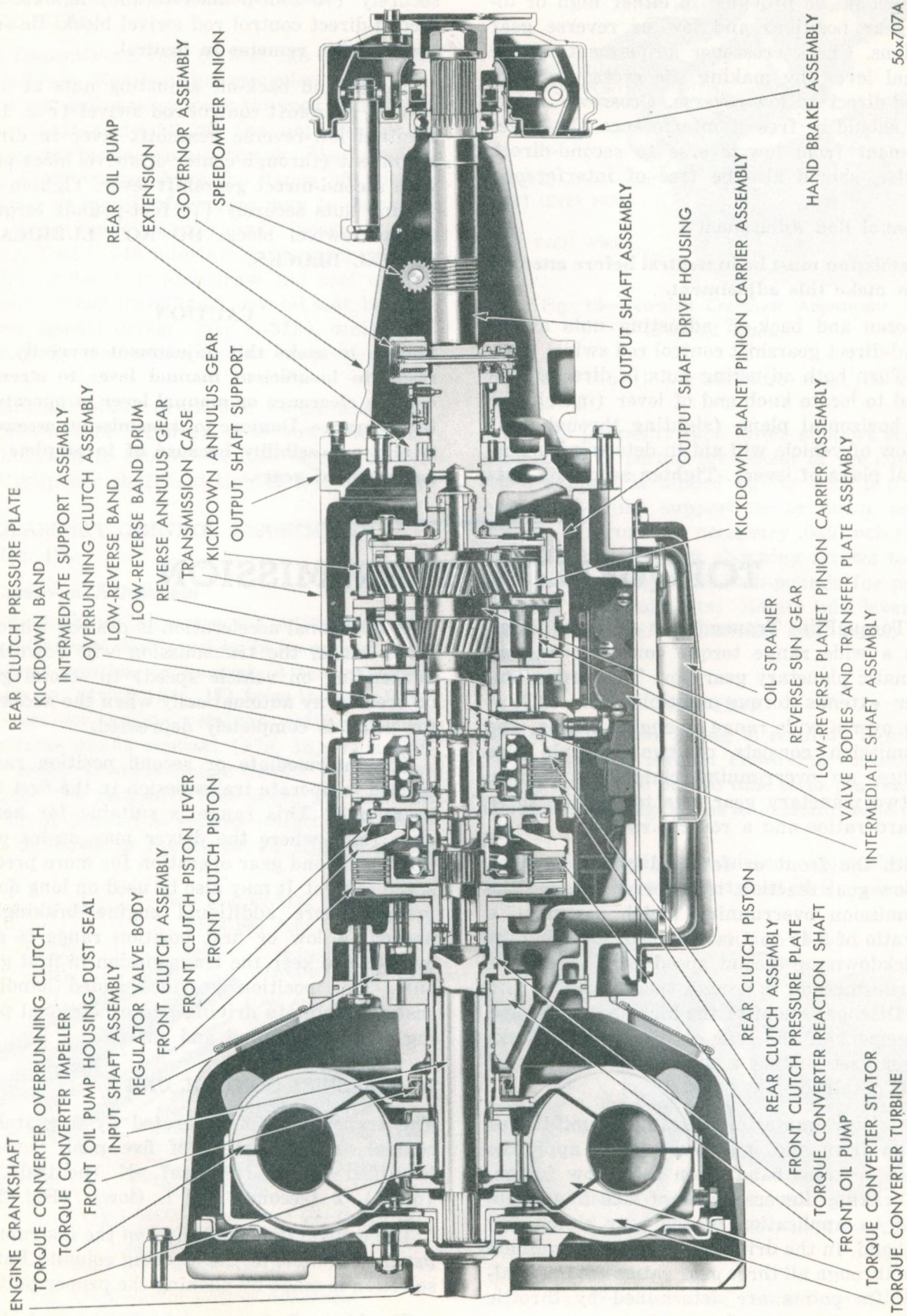
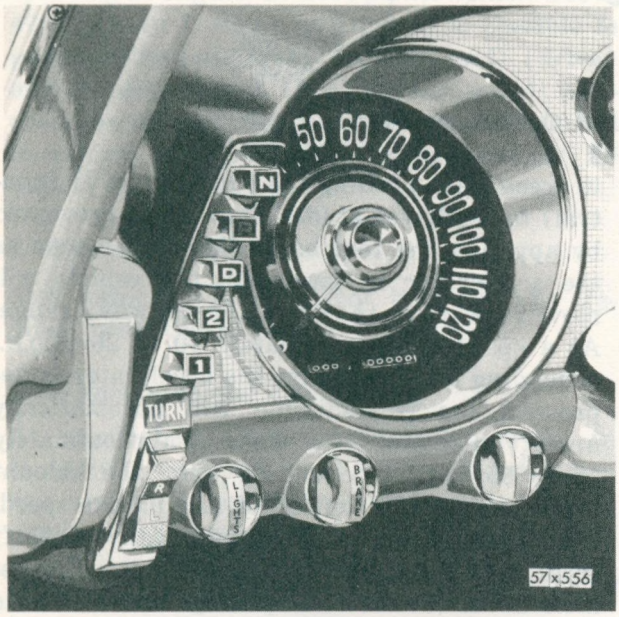


Fig. 20—TorqueFlite Transmission and Torque Converter (Sectional View)

Models C-75, C-76



Imperial

Fig. 21—Arrangement of Push Buttons

above approximately 15 m.p.h., it will move the manual control lever to the neutral position and when car speed drops below approximately 15 m.p.h. it will again be necessary to reposition the R (reverse) push button.

Mechanical connection between the gearshift control housing and the transmission manual control valve is obtained through the use of a single push-pull cable, as shown in Figure 22. One end of the wire cable is secured to the cable actuator in the gearshift control housing, while the other end enters the adapter housing on transmission case to engage the manual control valve lever assembly.

When button is pushed in, the slide contacts the cable actuator, causing it to pivot. Movement of the cable actuator about its axis moves the attached wire cable.

When the button nears its limit of travel, a lock on the button slide engages the actuator shaft. This action allows the slide lock to hold the button in the engaged position. (Fig. 22).

When the operator pushes another button to select a different range, the top or bottom portion (depending on which button was pushed) of the slide contacts the actuator, thereby releasing the first button from the restraint of the spring lock. The first button is then free to return (under spring force) to its original position.

A back-up light switch (when so equipped) is incorporated in the gearshift control housing and is operated by the R (reverse) push button slide.

A motor starting switch is also incorporated into the gearshift control housing (Fig. 22). The car is started by turning ignition switch to "ON" and pressing the N (neutral) push button beyond the neutral position to engage the motor starting switch. Should car stall, it is restarted by fully depressing the N (neutral) push button.

A vacuum switch, on the engine, prevents the starter from being energized should the N (neutral) push button be accidentally engaged while the engine is running. The starting motor is also wired so that the engine cannot be started unless the N (neutral) starting switch (at the transmission) is closed. Engaging the N (neutral) button closes starting motor circuit at neutral starting switch (Fig. 40). The purpose of the neutral starting switch (on the transmission) is to prevent starting the engine while the transmission is in gear, as a result of improper gearshift control cable adjustment.

8. STARTING THE ENGINE

As a safety precaution, apply hand or foot brakes. Turn ignition key to "ON" position. Depress accelerator slightly and push in the N (neutral) push button to limit of its travel. When engine starts, release pressure on N (neu-

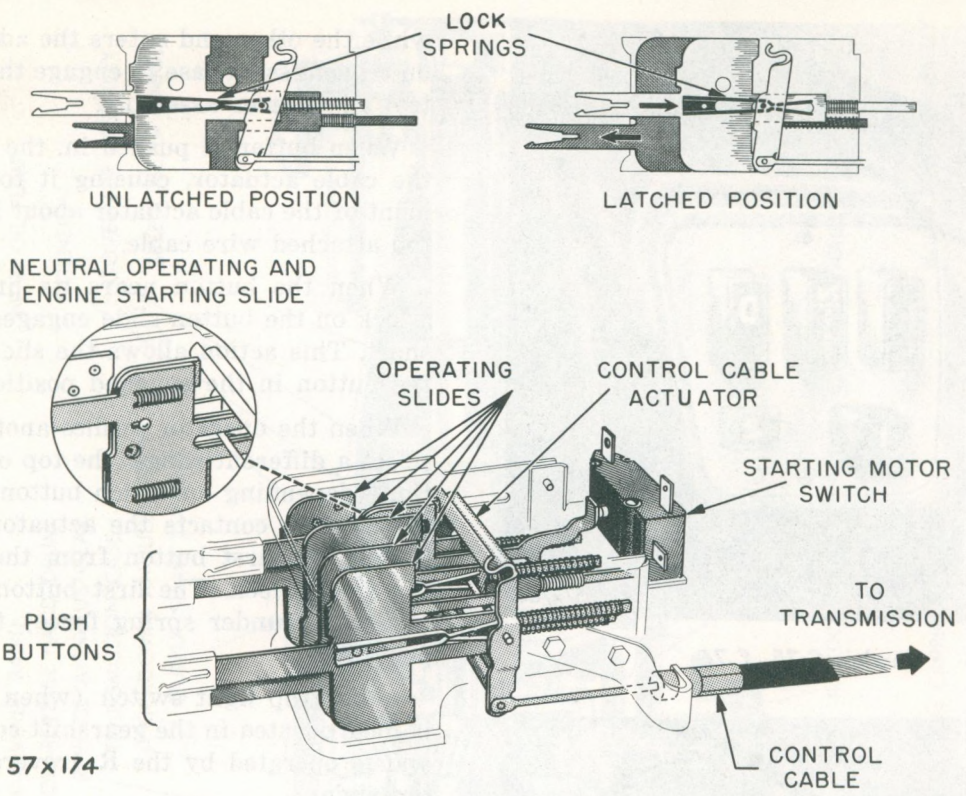


Fig. 22—Gearshift Control Unit (Operational Sketch)

tral) push button. If engine fails to start, release pressure on N (neutral) push button momentarily before attempting to start engine again.

9. PUSH STARTING

If engine fails to start in normal manner, it may be started by pushing. **Towing the car to start is not recommended due to the sudden surge of power when the engine starts.**

Turn ignition switch on, push L (low) button in and depress accelerator pedal slightly. After vehicle has been pushed to a speed of 15 m.p.h. (approximately), the transmission will drive engine.

10. HOW TO DRIVE THE CAR

When starting in extremely cold weather, allow engine and transmission to warm up while in N (neutral) position. If engine is cold (engine on fast idle), apply foot brake lightly to prevent a tendency to creep when making a push button selection.

a. D (drive)

All normal forward driving will be done in this range. The vehicle will have a slight tendency to creep after pushing the button from N (neutral) to D (drive) at idle. This can be prevented by applying the foot brake lightly. As soon as the accelerator is depressed, the vehicle will move forward in the drive (breakaway) range. At a speed of approximately 10 to 25 m.p.h., depending on the amount the accelerator is depressed, the transmission will automatically upshift to second. At a speed of approximately 15 to 55 m.p.h., depending upon the amount the accelerator is depressed and on car speed, the transmission will automatically upshift from second to direct. When slowing the vehicle down (at throttle openings short of wide open) the transmission will automatically downshift from direct to breakaway at approximately 10 m.p.h.

b. 2 (second)

Position provides driving characteristics similar to D (drive)—second speed except that the transmission will not upshift into direct at vehicle speeds below approximately 75 m.p.h. That is, as soon as accelerator is depressed, the vehicle will move forward in the drive (breakaway) range. At a speed of approximately 7 to 42 m.p.h., depending on the amount accelerator is depressed and on car speed the

transmission will automatically upshift into second. If vehicle is accelerated in second gear to wide open throttle upshift speed, an upshift to direct will occur, thus eliminating over speeding engine in second gear. If vehicle speed falls below approximately 10 m.p.h. or the accelerator is completely depressed, at speeds below approximately 30 m.p.h., transmission will automatically downshift to breakaway. It is possible to push buttons from 2 (second) to D (drive) or D (drive) to 2 (second) at any speed; however, transmission will not downshift to second gear if vehicle speed is above approximately 65 m.p.h.

c. 1 (low)

Provides driving characteristics similar to D (drive—breakaway) except that the transmission will not upshift into any other range regardless of vehicle speed. To prevent overspeeding of engine, do not operate vehicle above 40 m.p.h. in 1 (low) position. **It is possible to push the buttons from 1 (low) to D (drive) and D (drive) to 1 (low) at any speed; however, the transmission will not downshift to low if vehicle speed is above approximately 29 m.p.h.**

d. R (reverse)

Stop vehicle and with foot brake lightly applied, push the R (reverse) button in.

e. Kickdown (forced downshift)

At speeds below approximately 30 m.p.h., in D (drive) or 2 (second), after transmission has upshifted, maximum acceleration can be obtained for passing or climbing a steep grade by completely depressing the accelerator. This will cause the transmission to downshift to breakaway. The transmission will automatically upshift to second if the accelerator is released or a speed of approximately 45 m.p.h. is reached. In D (drive) range from second speed transmission will automatically upshift into direct if the accelerator is partially released or a speed of approximately 75 m.p.h. is reached. If vehicle is accelerated in 2 (second) position to wide open throttle upshift speed, an upshift to direct will occur thus eliminating overspeeding the engine in second gear.

f. Kickdown (forced downshift)

At speeds between 30 to 65 m.p.h. (approximately) in D (drive) position after transmissin has upshifted into direct, maximum acceleration can be obtained for passing by completely depressing accelerator. This will cause the transmission to downshift to second. The transmission will automatically upshift to direct if accelerator is released or a speed of approximately 75 m.p.h. is reached.

11. TOWING

Transmission Inoperative

Tow the vehicle with a rear end pickup or remove the propeller shaft.

12. TRANSMISSION OPERATING PROPERLY

The vehicle may be towed safely in N (neutral) at moderate speeds. For long distance towing (over 100 miles), the propeller shaft should be removed.

THE PLANETARY GEAR SET

13. CONSTRUCTION

The planetary gear set, as shown in Figure 23 consists of: An annulus gear or internal gear, a planet pinion carrier with three planet pinion gears and a sun gear.

The annulus gear surrounds and meshes with the planet pinion gears. The planet pinion gears are free to rotate on planet pinion shafts in planet pinion carrier. The sun gear rotates inside and is also meshed with planet pinions.

14. OPERATION

A planetary gear set may be used to increase torque and reduce speed. This is done by holding the sun gear and driving the annulus gear, as shown in Figure 24. The annulus gear will turn the planet pinion gears on their shafts and at the same time cause the planet pinion gears to move around the sun gear.

The planet pinion carrier will, therefore, be forced to rotate in the same direction as the

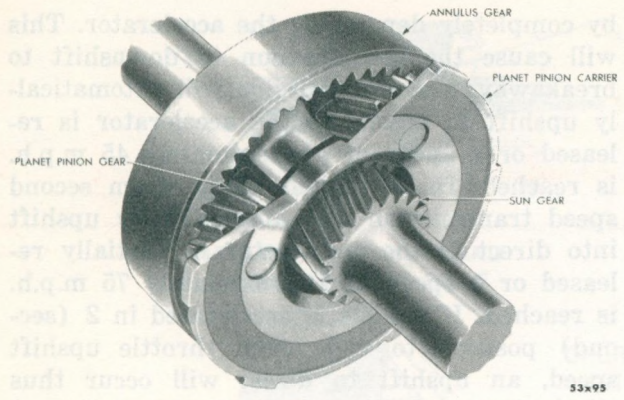


Fig. 23—Planetary Gear Set

annulus but at a slower speed. The gear set in this case operates as a speed-reducing, torque-increasing device. Further reduction may be obtained by adding planetary gear sets and providing a means of holding various members to obtain proper ratios.

The direction of rotation may be reversed by use of a planetary gear set. By holding the planet pinion carrier stationary and driving the sun gear, the planet pinion gears will rotate on their shafts (Fig. 25). Because the planet pinion carrier cannot move, the planet pinion gears operate as idlers and transmit the torque to the annulus gear. This drives the annulus gear in the reverse direction at reduced speed but with increased torque.

If any two members of a planetary gear set are locked together (as the annulus gear and sun gear in the case illustrated in Figure 26) a direct or 1 to 1 drive is obtained. There is no movement **between** the gears.

If no two members are locked together and no member is held from rotating, no torque will be transmitted. This provides **neutral** operation.

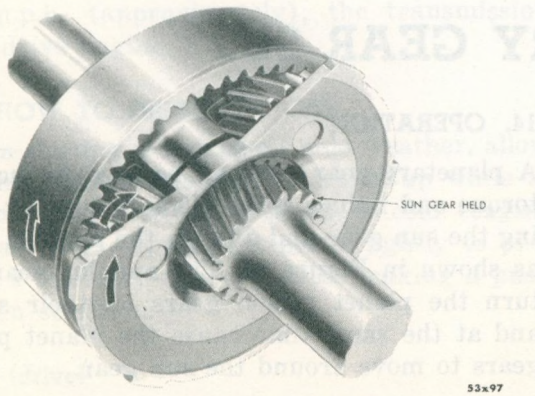


Fig. 24—Planetary Gear Set (Sun Gear Held—Gear Reduction)

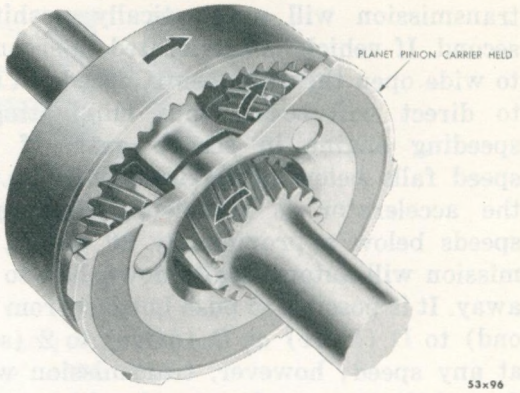


Fig. 25—Planetary Gear Set (Planet Pinion Carrier Held)—Reverse

15. OVERRUNNING CLUTCH

The overrunning clutch consists of a cam, cam rollers, cam springs, and a clutch hub. The cam, which provides the ramps, is riveted to the intermediate support so that it is prevented from turning. The overrunning clutch hub is splined in the low-reverse band drum with the reverse planet pinion carrier assembly. Connection between the cam and hub is obtained through the rollers.

When torque is applied to the reverse planet pinion carrier and overrunning clutch hub by the sun gear, the clutch rollers are forced outward into a wedging contact by the ramps in the cam, thus holding the planet pinion carrier.

If the driving force is removed, the rollers are released from their wedging contact and the overrunning clutch will coast. The overrunning clutch is used in the 1-2 upshift, normal 2-1 downshift, and forced 2-1 downshifts. For 1 (low) range operation, the low-reverse band is applied, holding the reverse planet pinion carrier stationary, thus preventing the overrunning clutch from coasting.

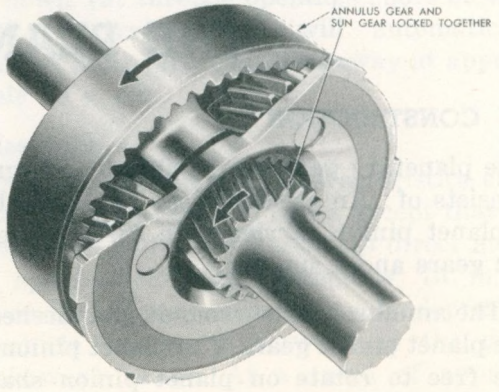
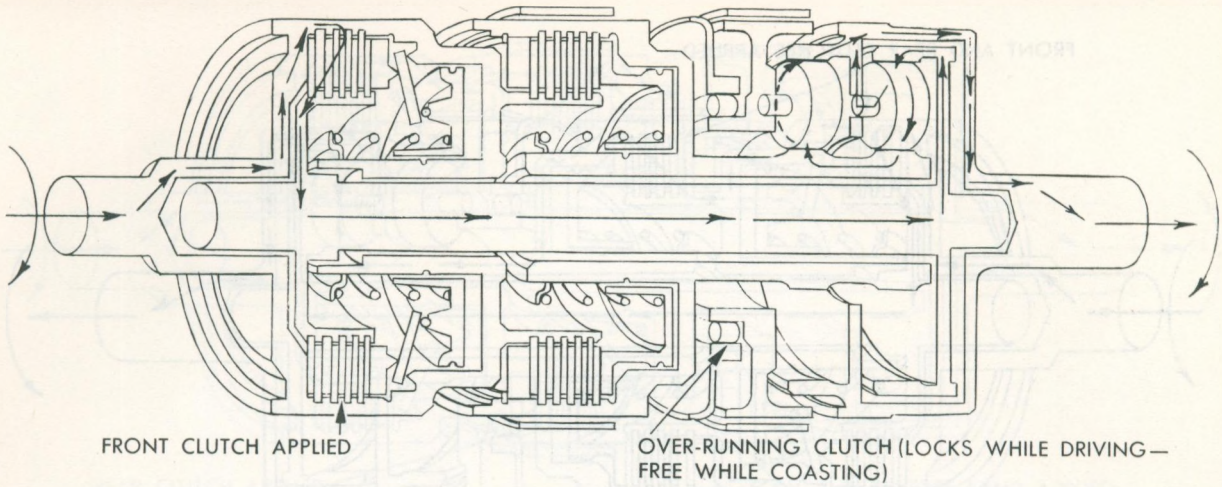


Fig. 26—Planetary Gear Set (Annulus and Sun Gear Locked)—Direct



DRIVE POSITION—BREAKAWAY 56x689

Fig. 27—Power Flow in D (Drive) Position—Breakaway

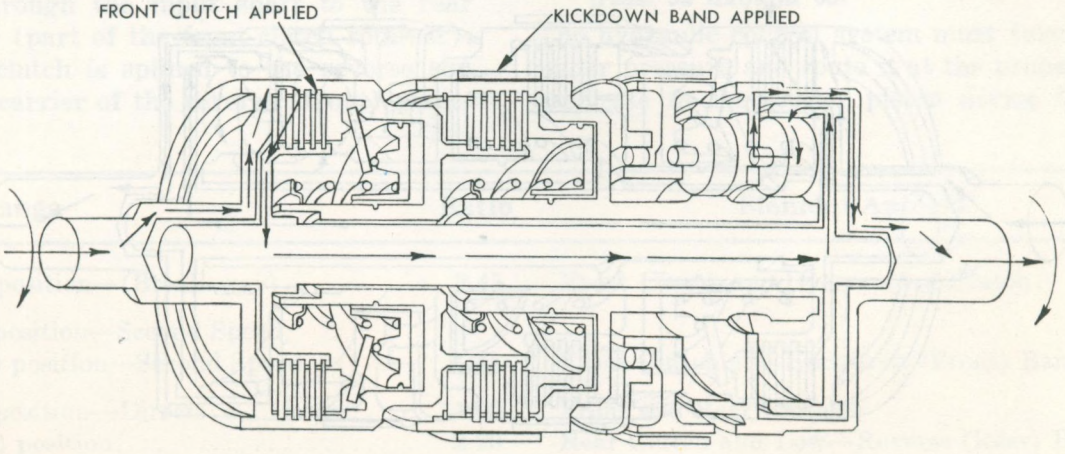
16. POWER FLOW IN THE TRANSMISSION

a. D (Drive) Position—Breakaway—(Fig. 27)

The power flow is from the converter turbine through the input shaft and front clutch retainer (one unit). The front clutch is applied and the drive continues through the clutch hub to the intermediate shaft and kickdown annulus gear (one unit). The kickdown annulus gear drives the kickdown planet pinion gears, rotating them in the same direction. The kickdown planet gears are meshed with the kickdown sun gear which in turn is integral with the reverse sun gear. Both sun gears are forced to rotate in a reverse direction by the reaction of the kickdown planet pinion carrier together with the reverse annulus gear, both of which are splined to the output shaft drive housing. The reverse planet pinion carrier is attached to and prevented from turning backward by an overrunning clutch and becomes stationary in forward drive (overruns on coast). Therefore, the reverse carrier pinions are forced to rotate in a forward direction and force the reverse annulus to rotate in the same direction transmitting the power flow to the output shaft with the combined ratio of the kickdown and reverse planetary gear sets of 2.45 to 1.

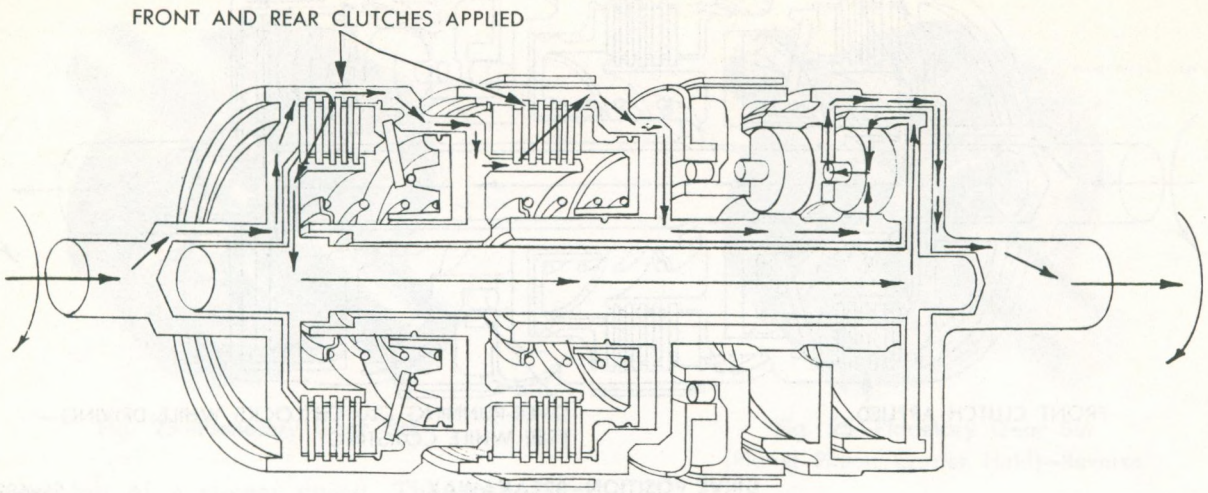
b. D (Drive Position—2nd Speed and 2 (Second) Position—2nd Speed (Fig. 28)

The power flow is from the torque converter turbine through the input shaft to the front clutch (which is applied). From the front clutch through the intermediate shaft to the annulus gear of the kickdown (rear) planetary



DRIVE POSITION—2ND ALSO 2ND SPEED IN 2ND POSITION 56x690

Fig. 28—Power Flow in D (Drive) Position—2nd Speed and 2 (second) Position—2nd speed



DRIVE POSITION—DIRECT DRIVE 56x688

Fig. 29—Power Flow in D (Drive) Position—Direct

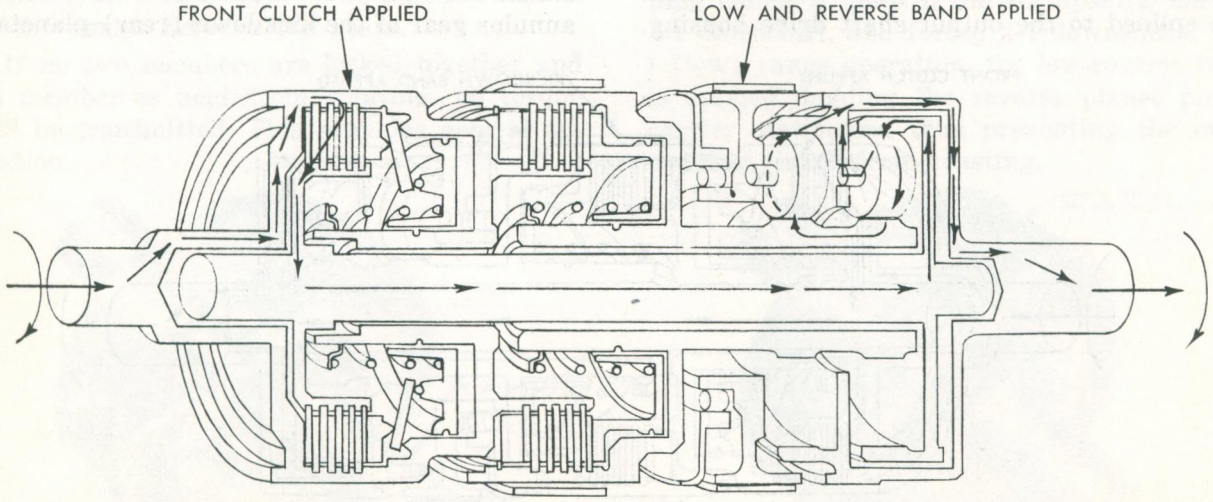
gear set. The kickdown band is applied which holds the sun gear stationary. The annulus gear drives the kickdown planet pinions which rotate in the same direction as the input and intermediate shafts. The kickdown planet pinions are meshed with the sun gear; therefore, they walk around this gear and exert force through the kickdown planet pinion shafts to rotate the kickdown planet pinion carrier. The carrier, which is splined to the output shaft drive housing, moves at a slower speed than the annulus gear, thus providing a gear ratio of 1.45 to 1.

c. D (Drive) Position—Direct (Fig. 29)

The power flow from the torque converter goes directly through the transmission because the planetary elements of the gear train are locked up by two multiple disc clutches and both bands are released. The torque converter provides all of the torque multiplication.

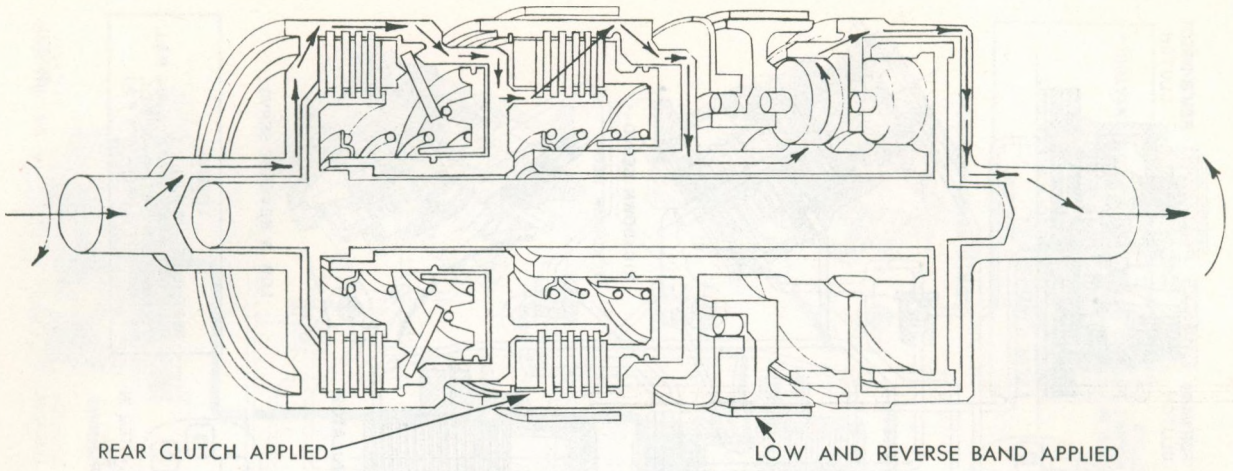
d. Kickdown (Forced Downshift) In D (Drive) Position Below 30 m.p.h.

This will force the transmission to downshift and the power flow will be the same as D (drive) position (breakaway).



LOW POSITION 1 LOW SPEED 56x691

Fig. 30—Power Flow in L (Low) Position—Low Speed



REVERSE POSITION 56x692

Fig. 31—Power Flow in R (Reverse) Position

e. Kickdown (Forced Downshift) In D (Drive) Position 30 to 65 m.p.h.

This will force the transmission to downshift and the power flow will be the same as D (drive) position 2nd speed.

f. 1 (Low) Position—Low Speed—(Fig. 30)

In 1 (low) position the power flow is the same as D (drive) position (breakaway) or 2 (second) position (breakaway) with one exception, the low-reverse band is applied, locking the overrunning clutch to provide engine braking.

g. R (Reverse) Position (Fig. 31)

The rear clutch and the low-reverse band are applied: all other friction elements are released. The power flow is from the torque converter turbine through the input shaft to the rear clutch hub (part of the front clutch retainer). The rear clutch is splined to the reverse sun gear. The carrier of the reverse (front) planetary gear set is held stationary by the low-reverse band; therefore, the set acts as a simple reverse train through the reverse planet pinions to the reverse annulus (which is splined to the output shaft drive housing) and provides a reverse ratio of 2.20 to 1.

h. N (Neutral) Position

All friction elements are released. Hence, there is no drive connection between the engine and the rear wheels.

i. Power Flow Summary

The chart summarizes power flow conditions in the various ranges as regards to gear train elements involved and the ratios obtained.

17. HYDRAULIC CONTROL SYSTEM (Figs. 32 through 38)

The hydraulic control system must furnish oil under pressure and route it at the proper time and rate to the proper piston device for en-

Range	Ratio	Element Applied
D (drive) position—(Breakaway)	2.45	Front Clutch and Overrunning Clutch
D (drive) position—Second Speed, 2 (second) position—Second Speed	1.45	Front Clutch and Kickdown (Front) Band
D (drive) position—Direct	1.00	Front and Rear Clutches
R (reverse) position	2.20	Rear Clutch and Low—Reverse (Rear) Band
L (low) position—Low Speed	2.45	Front Clutch and Low—Reverse (Rear) Band
N (neutral)	....	No Clutch or Band

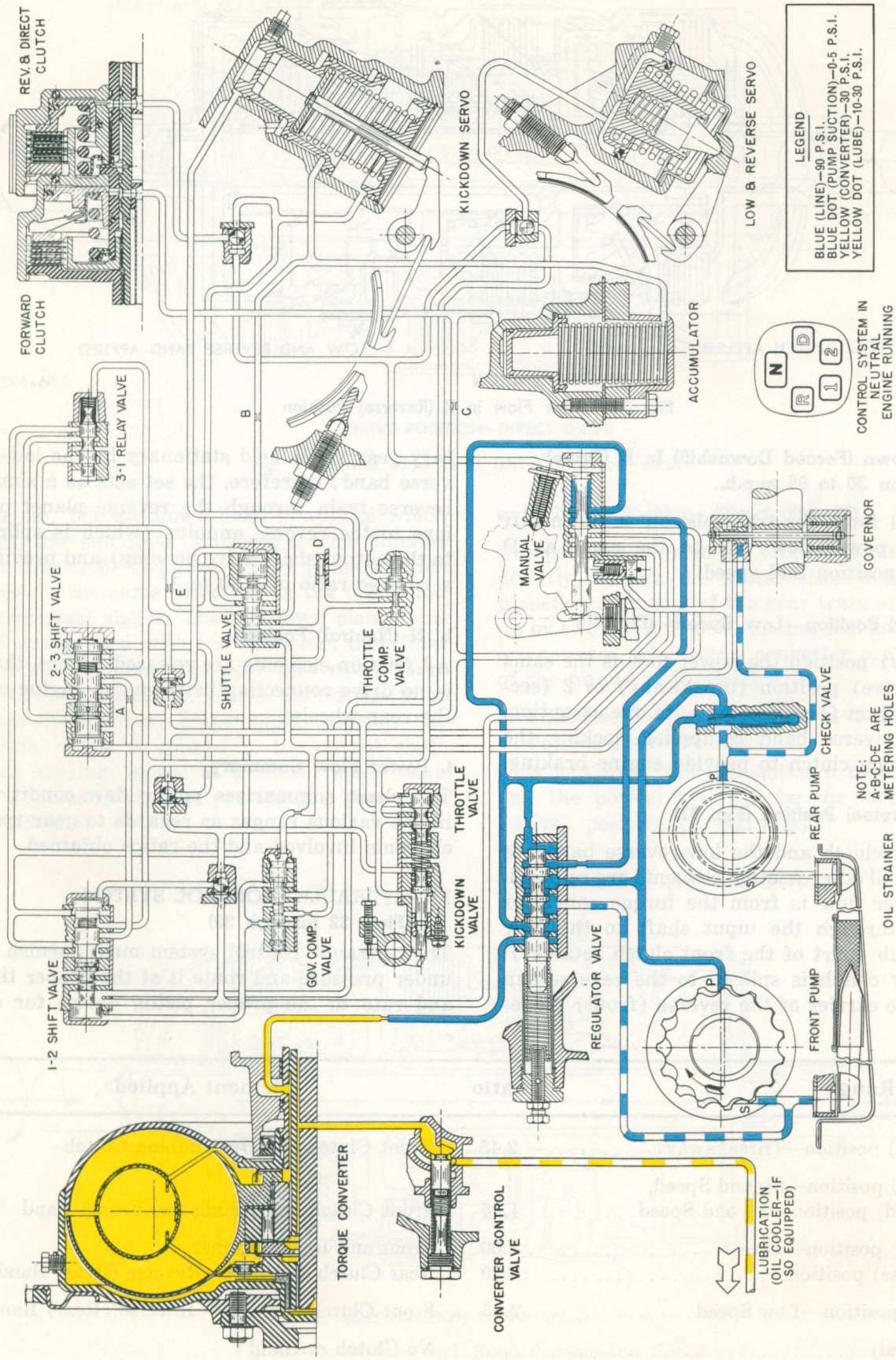


Fig. 32—Hydraulic Circuit—N (Neutral)

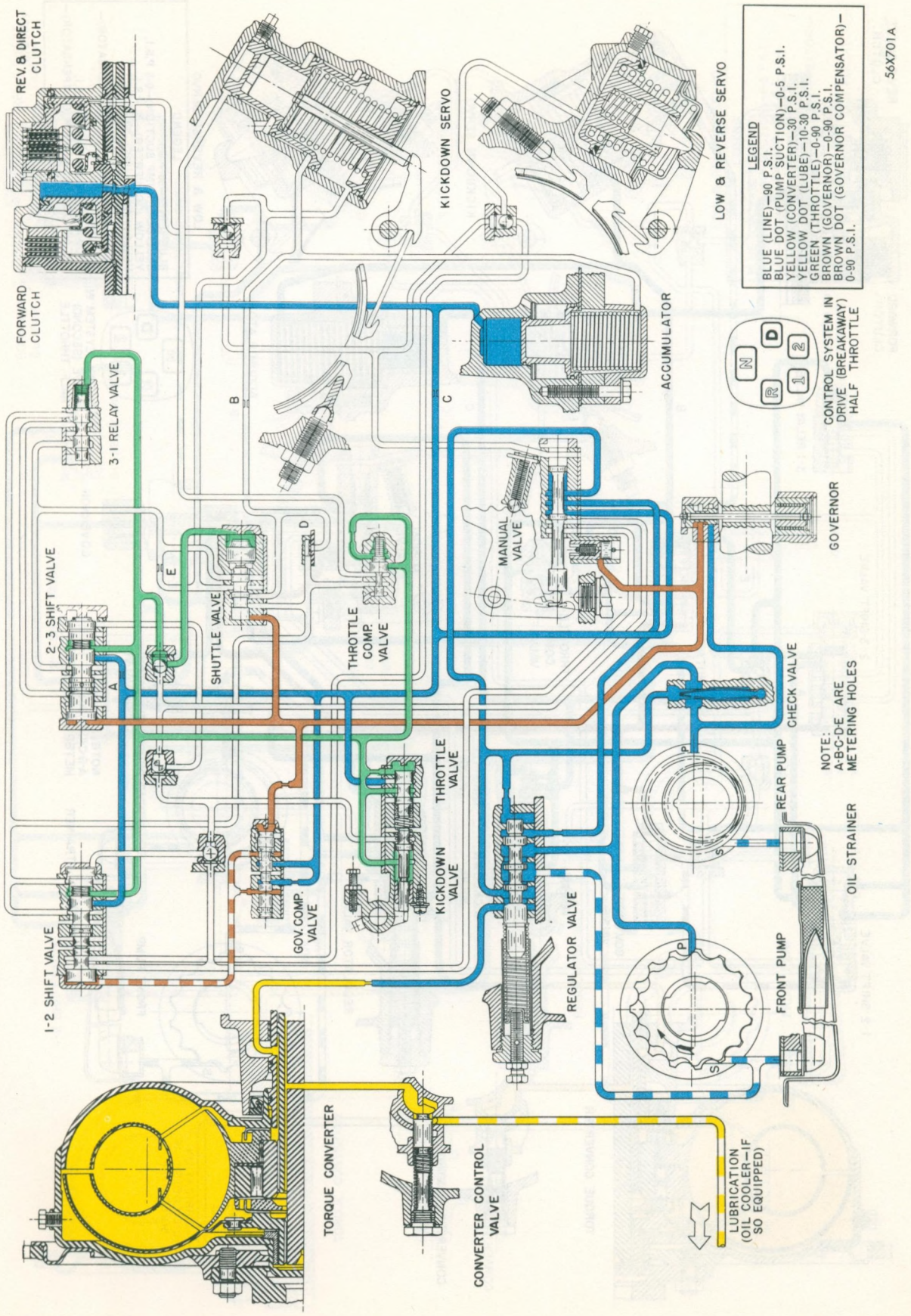


Fig. 33—Hydraulic Circuit—D (Drive)—Breakaway

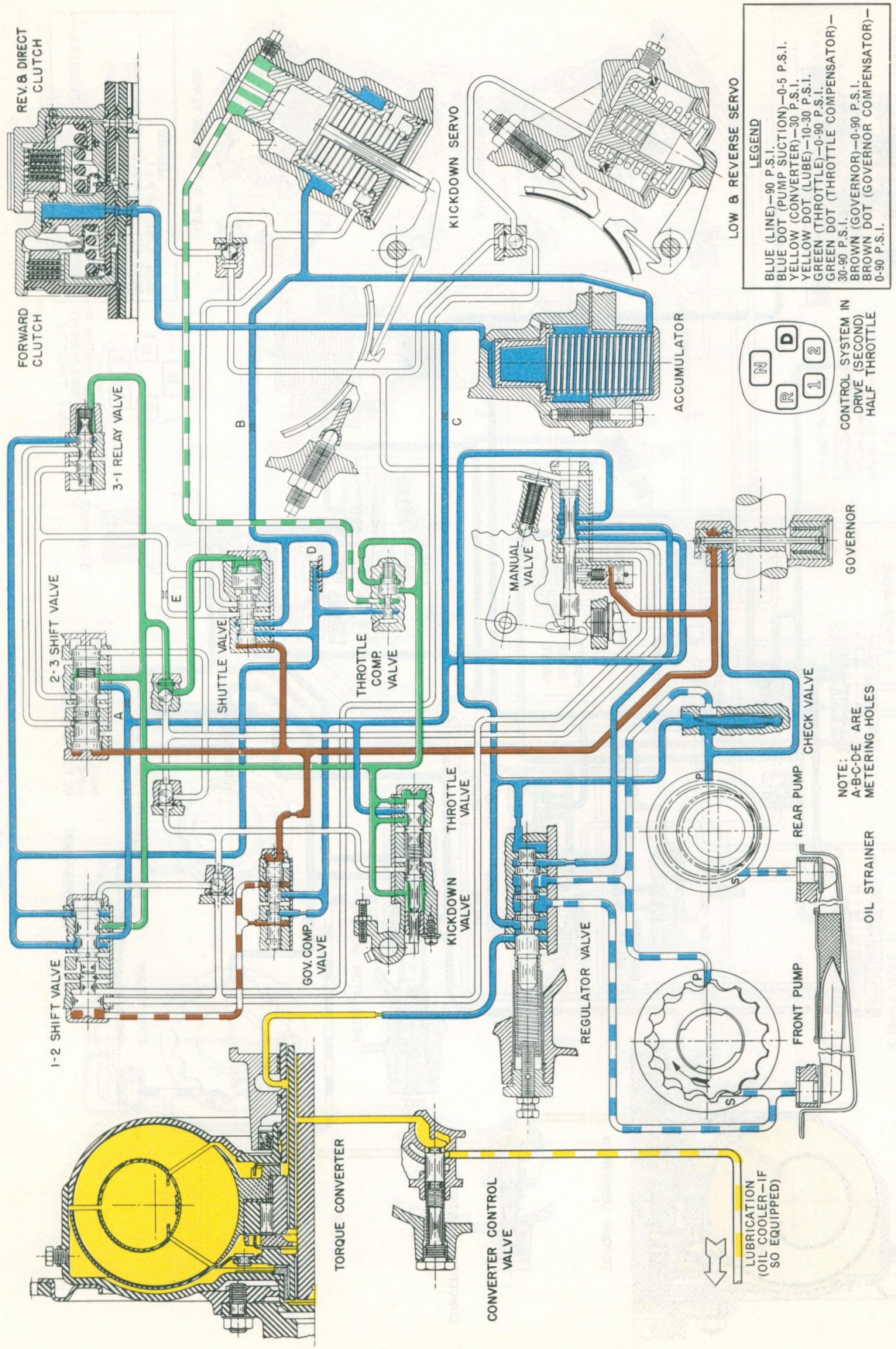


Fig. 34—Hydraulic Circuit—D (Drive)—Second

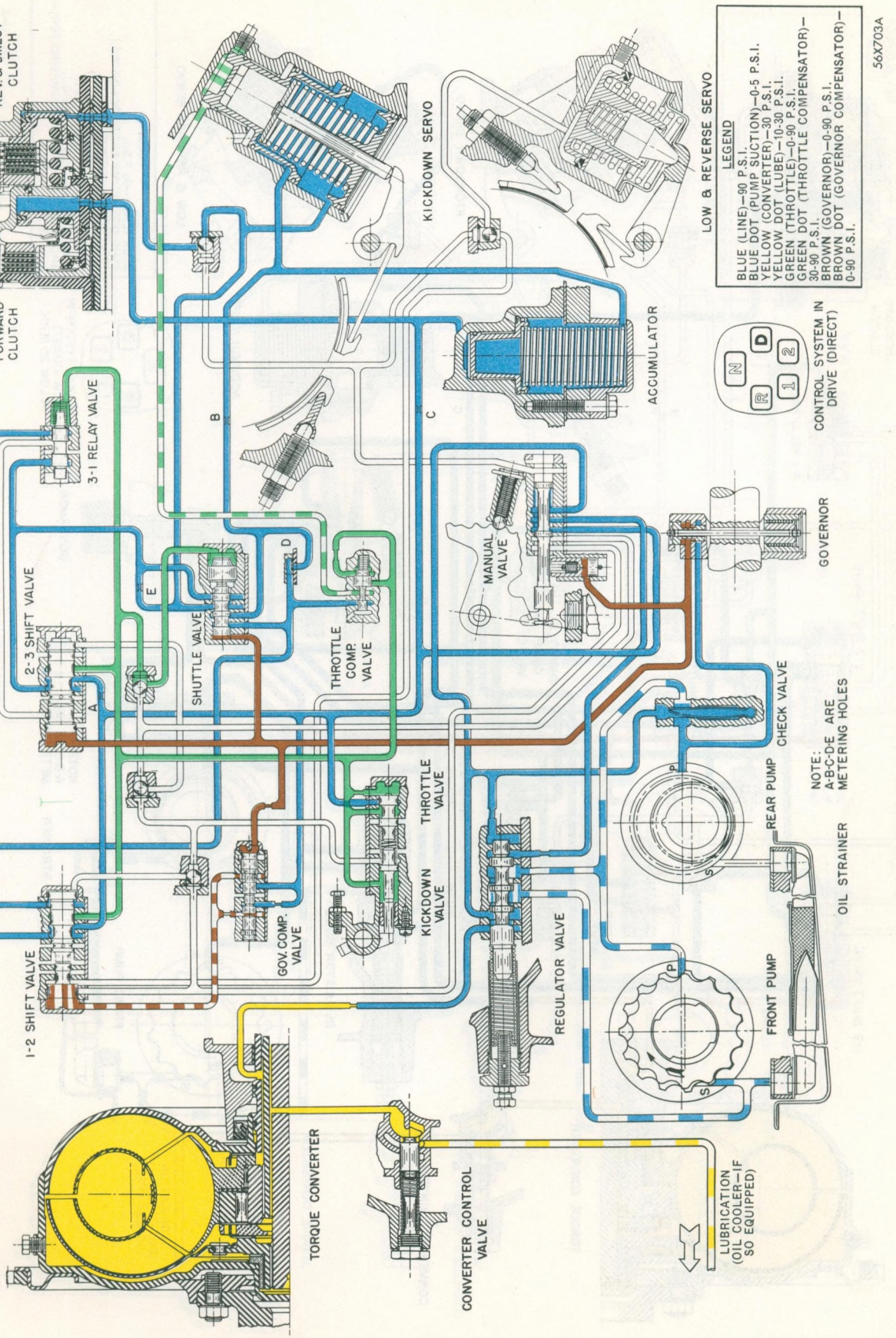


Fig. 35—Hydraulic Circuit—D (Drive)—Direct

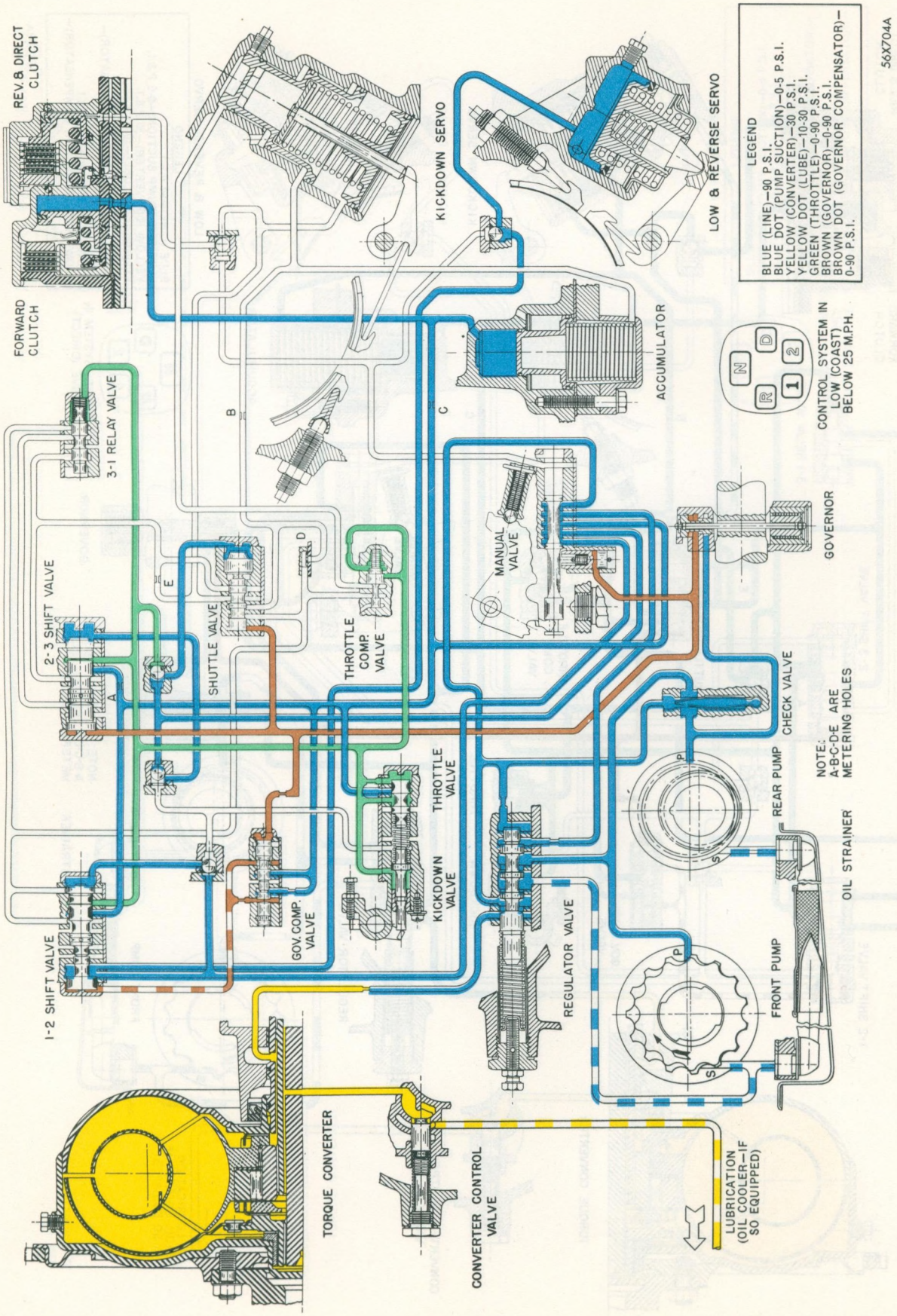


Fig. 36—Hydraulic Circuit—L (Low)—Low

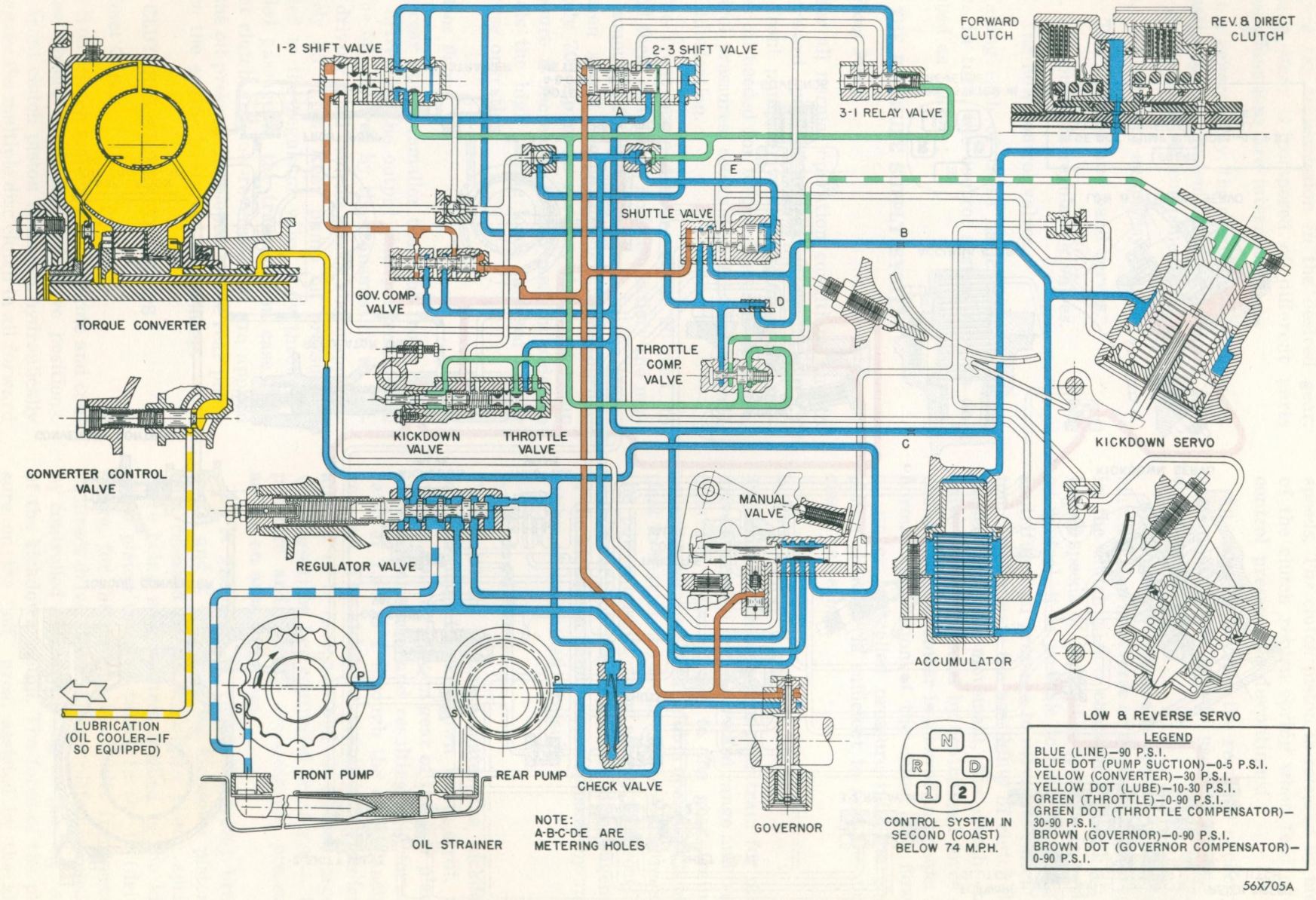


Fig. 37—Hydraulic Circuit—2 (Second)—Second

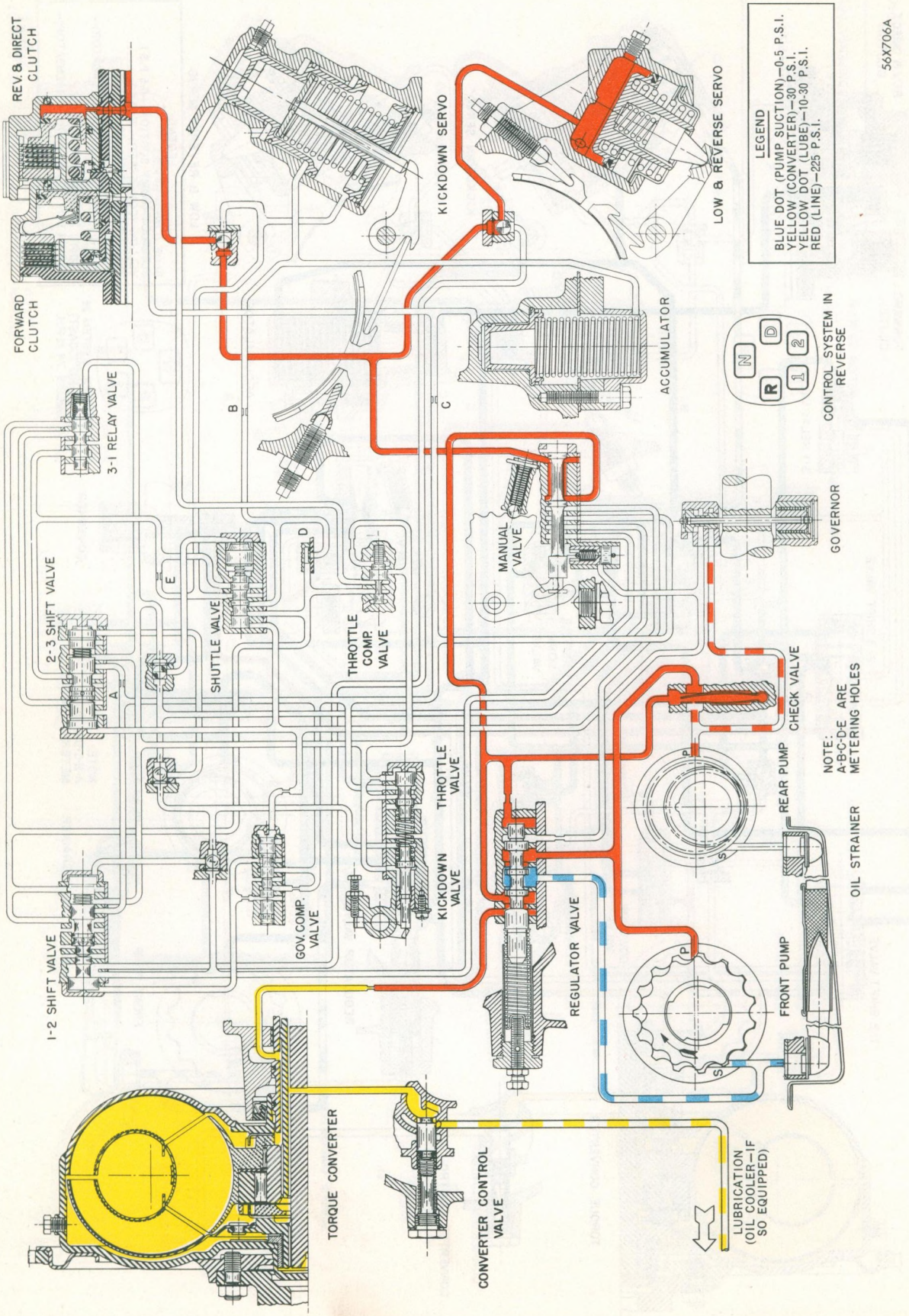


Fig. 38—Hydraulic Circuit—R (Reverse)

gaging the transmission in the desired gear. This system is composed of different parts whose functions are interrelated.

In a general way, the components of any automatic control system may be grouped into the following basic components or units:

a. The pressure supply system.

b. The clutches and band servos.

c. The pressure regulating valves.

d. The flow control valves.

Taking each of these basic components or units in turn, the control system may be described as follows:

18. THE PRESSURE SUPPLY SYSTEM

a. Front Pump

Under all normal operation conditions (up to a forward speed of approximately 35 m.p.h.) the front pump, driven at engine speed, provides oil needed for torque converter pressure, control pressures, cooler flow (if so equipped) and lubrication.

The front pump delivers oil at 90 p.s.i. to fulfill these conditions and also satisfy the normal amount of internal leakage in the transmission at all engine speeds above approximately 700 r.p.m. In reverse, the front pump pressure is increased to 225 p.s.i. in order to handle the high torque loads imposed during reverse operation.

b. Rear Pump

The rear pump (smaller than the front pump and driven by the output shaft) furnishes all of the oil required by the transmission in normal driving at all vehicles speeds above approximately 35 m.p.h. Rear pump oil pressure is routed to the regulator valve body through a drilled passage in the transmission case. The front clutch and low-reverse band are applied by the oil pressure developed by the rear pump when the engine is started by pushing.

19. CLUTCHES AND BAND SERVOS

a. Front Clutch

The front clutch transmits full engine and converter torque in all forward drive positions. The front clutch piston is moved hydraulically to engage the multiple disc clutch in all forward speeds. The clutch piston is released by means of the clutch return spring when feed of the control pressure is discontinued.

In order to develop the required capacity, a system of levers (4) is used to actuate the clutch apply plate.

Although no pressure is applied to the front clutch piston in reverse or neutral, oil is present in the clutch piston chamber. With high rotative speeds of the clutch retainer in reverse or neutral, it is possible to build up sufficient centrifugal oil pressure to move the clutch piston. To eliminate the possibility of clutch drag caused by such movement, the clutch check valve ball is unseated by centrifugal force and the oil in the chamber is allowed to escape. For normal application of the clutch, the flow of oil under controlled pressure into the clutch piston chamber is sufficient to seat the clutch check valve ball.

b. Rear Clutch

The rear clutch locks the gear train for direct drive operation in the forward range and transmits full input torque to the gear train in reverse operation. Rear clutch operation is identical to that of the front clutch. When making the power upshift from second to direct, the engagement of the clutch and disengagement of the kickdown band is accomplished by application of controlled pressure.

c. Kickdown Servo

The kickdown piston actuates the kickdown band through the kickdown lever, strut, and anchor, holding the sun gear of the rear planetary set stationary and resulting in a forward ratio of 1.45 to 1 through the rear planetary gear set. The kickdown piston is hydraulically applied in 2 (second) and D (drive) second (kickdown) by two controlled pressures — line pressure and throttle compensator pressure-acting on separate areas.

In N (neutral), 1 (low) D (drive) breakaway, and R (reverse) the kickdown piston is held released by the kickdown piston spring, there being no pressures applied to the kickdown piston at these times. In the D (drive) range, for the automatic upshift from second to direct drive, the kickdown piston is released by controlled pressure acting on the "off" area of the kickdown piston. The force of the pressure on the "off" area, assisted by the kick-

down piston spring, is sufficient to overcome the forces of line pressure and throttle compensator pressure acting on the apply side of the kickdown piston.

Application of the kickdown piston when shifting from breakaway to second is softened by the accumulator.

d. Low-Reverse Servo

The low-reverse servo has two functions which are performed independently. The low-reverse servo piston is moved hydraulically to apply the low-reverse band through the low-reverse band lever, strut, and anchor. The results are:

(1) To hold the carrier of the front planetary gear set stationary while the rear clutch (applied) drives the sun gear. This provides a reverse ratio of 2.20 to 1 through the front planetary gear set, as shown in Figure 31.

(2) To hold the carrier of the front planetary gear set stationary while the front clutch (applied) drives the intermediate shaft and kickdown annulus. This provides the L (low) range operation at a ratio of 2.45 to 1 through both planetary gear sets (Fig. 30) which may be used for engine braking. On initial engagement, oil is admitted to the chamber behind the low-reverse servo piston. Initial engagement of the low-reverse servo (when shifting from neutral to low or reverse) is softened by compression of the low-reverse servo cushion spring.

The servo piston is released by a return spring when the source of apply pressure is discontinued.

e. Accumulator

An accumulator cushions the application of the kickdown band in the upshift from breakaway to second. It is connected in parallel to the passage which supplies line pressure to the apply side of the kickdown servo.

In neutral and reverse the accumulator piston is held released by the accumulator spring, there being no pressure applied to the piston at these times.

In the D (drive) range, for the automatic upshift from breakaway to second, the accumulator piston is again moved by line pressure (kickdown servo apply) acting on the large end of the piston. The force of line pressure assisted by the accumulator spring is sufficient to overcome the force of line pressure (front clutch) which is acting on the small area of the accumulator piston. This action cushions the application of the kickdown band.

20. PRESSURE REGULATING VALVES

a. Regulator Valve

The regulator valve controls line pressure at a value of approximately 90 p.s.i. for all operating conditions except reverse. Line pressure, which is supplied by the front pump (at car speeds under 35 m.p.h.) is routed directly to a primary reaction area in the regulator valve body. For all conditions except reverse, line pressure is also routed through the front valve body to the secondary reaction area. A line pressure of 90 p.s.i. (acting on the two reaction areas) is sufficient to overcome the force of the regulator valve spring and move the valve to the position that will allow oil to flow through a restricting hole in the regulator valve body to the torque converter.

If the oil flow from the front pump exceeds the amount necessary to feed the torque converter and transmission, line pressure will rise slightly, causing the regulator valve to move to a new position where excess oil from the front pump pressure port is allowed to dump into the front pump suction port.

Above a car speed of approximately 35 m.p.h., the rear pump furnishes the oil needed by the torque converter and transmission at a line pressure of 90 psi. When this condition is reached, the pressure increases slightly and the regulator valve moves over to a new position where the excess flow is dumped from the line pressure port into the front pump suction port. Under this condition the front pump check valve closes and all of the oil pumped from the front pump is dumped back through the large valve opening into the front pump suction port. Thus the front pump turns with reduced effort since it is operating at a low pressure.

For reverse operation, oil must be at a pressure of 225 psi. This is accomplished by shutting off the source of line pressure to the secondary reaction area, with the result that a line pressure of 225 psi. applied to the primary reaction area is required to overcome the force of the regulator valve spring.

b. Torque Converter Control Valve

This valve maintains an oil pressure of 30 psi.

within the torque converter. Oil is fed from the regulator valve through a restricting hole in the regulator valve body to the torque converter. The oil flows through the torque converter and returns to the regulator valve body where the converter pressure is regulated by the torque converter control valve.

When the torque converter pressure rises to 30 psi., the control valve will move against the spring load and allow oil to flow to the lubrication circuit. Torque converter pressure acts on the valve's reaction area such that if it exceeds 60 psi., the valve is moved further against the spring load, permitting excess oil from the converter to by-pass into the oil pan. From the torque converter control valve, oil is routed through heat exchanger in the bottom of the radiator (water cooled transmission only) and through the transmission lubrication system to lubricate the gear train.

c. Governor Valve

The governor valve assembly transmits a hydraulic pressure to the transmission which is proportional to car speed. This governed pressure, in conjunction with throttle pressure, controls upshift and downshift speeds. The governor is so mounted on the output shaft that when the output shaft rotates, the governor weight assembly exerts a centrifugal force on the governor shaft. The governor shaft transmits this force to the governor valve. Oil is allowed to flow from the line pressure port to the governor pressure port, building up pressure in the governor circuit and against the valve reaction area sufficient to balance the centrifugal force of the weight.

The greater the vehicle speed, the greater is the centrifugal force of the weights, and hence the greater the governor pressure necessary to balance the centrifugal force. If the vehicle speed decreases, the decrease in centrifugal force allows the valve to move out **slightly,** venting excess oil and bringing the governor once more in balance at a lower pressure.

The governor weight assembly is constructed so that for vehicle speeds under approximately 25 m.p.h., both weights act as a unit, with the result that small changes in vehicle speed result, in comparatively large changes in centrifugal force and governor pressure. Above approximately 25 m.p.h., the primary weight moves outward against the preload of the spring and bottoms against the snap ring leaving only the secondary weight active. Small variations in vehicle speed above approximately 25 m.p.h., therefore, result in only small variations in governor pressure.

Governor pressure is routed to the governor pressure ports of the governor compensator valve, shuttle valve, and the 2-3 shift valve governor plug.

d. Governor Compensator Valve

This valve is designed to produce a pressure relative to governor pressure to fulfill the requirements of the 1-2 shift pattern. The governor compensator valve train consists of valve, spring and plug.

The governor compensator valve allows oil to flow from the line pressure port to the governor compensator valve pressure port. Governor pressure acts on one end of the compensator valve while the plug (with governor compensator and line pressures) acts on the other. At low vehicle speeds (low governor pressure) the plug is inactive, and the governor compensator pressure is approximately 2½ times greater than governor pressure.

As vehicle speed increases, governor compensator pressure will move the plug against the valve. When governor compensator pressure reaches 40 psi. (approximately 20 m.p.h.) the plug becomes active. When this happens, the governor compensator pressure then becomes approximately 1⅓ times greater than governor pressure. Governor compensator pressure is routed to the 1-2 shift valve governor plug.

e. Throttle Valve

The throttle valve assembly transmits a hydraulic pressure to the transmission which is proportional to the amount of throttle opening. The throttle valve lever shaft is rotated in proportion to the amount of throttle opening of the carburetor by a linkage connecting the throttle valve lever shaft to the car's throttle linkage. The throttle valve lever shaft positions the kickdown valve and throttle valve spring in accordance with the amount of carburetor throttle opening, the spring being free (no load) at closed throttle and compressed at wide open throttle. Therefore, the throttle valve spring exerts a force on the throttle

valve that increases with carburetor throttle opening.

The throttle valve allows oil to flow from the line pressure port to the throttle pressure port, which is connected by a passage to the reaction area of the throttle valve. Throttle pressure will build up in the throttle pressure circuit and against the reaction area until it reaches a value great enough to balance the force of the throttle valve spring. If throttle pressure builds up too high, the throttle valve will move **slightly** to a position such that excess oil is allowed to escape through the vent port.

Throttle pressure will vary with the amount of carburetor throttle opening from a value of 0 (zero) pressure at closed throttle to a value of approximately 90 psi. at wide open throttle. Throttle pressure is routed to the following places:

(1) Throttle pressure port of the kickdown valve.

(2) Throttle pressure port of the throttle compensator valve.

(3) Through check valve to throttle pressure port of the shuttle valve plug.

(4) To the throttle pressure port of the 3-1 relay valve.

(5) To the throttle pressure port of the 2-3 shift valve kickdown plug.

(6) To the throttle pressure port of the 1-2 shift valve kickdown plug.

f. Throttle Compensator Valve

The throttle compensator valve amplifies the variations in throttle pressure. It allows oil to flow from the line pressure port of the 1-2 shift valve (in the upshifted position) to the throttle compensator valve pressure port. Throttle compensator pressure is controlled by throttle pressure and spring force acting on one end of the valve against a reaction area fed by compensator pressure. Throttle compensator pressure will vary with the amount of carburetor throttle opening from a value of approximately 30 psi. at closed throttle to a value of 90 psi. at approximately ¾ throttle. This arrangement makes it possible to more closely obtain the variations required for the 1-2 and 2-3 shifts. Throttle compensator pressure is routed to the throttle compensator pressure area of the kickdown servo.

21. FLOW CONTROL VALVES

a. Front and Rear Pump Check Valves

The front pump check valve prevents back flow from line pressure into the pressure side of the pump when the pump is either stationary or merely circulating oil at a very low pressure. The rear pump check valve allows oil to flow from the rear pump into the control system of the transmission. However, due to the metering hole in the valve, it restricts back flow from line pressure into the pressure side of the pump when the pump is stationary or rotating backwards. The front and rear pump check valves are combined as a leaf spring unit and mounted in the regulator valve body behind the front pump.

b. Manual Valve

The manual valve selects the different transmission drive ranges as dictated by the vehicle operator. The manual valve is moved by a cable which is connected to the push button control unit on the instrument panel. It is held in these positions by the force of a spring-loaded detent ball.

When the N (neutral) button is pushed in, the manual valve is positioned so that line pressure from the regulator valve is routed to the secondary and primary reaction areas of the regulator valve. Line pressure is, therefore, 90 psi. but neither the bands nor the clutches are applied.

When the R (reverse) button is pushed in, the manual valve shuts off line pressure to the secondary reaction area of the regulator valve and routes line pressure (at 225 psi.) to the rear clutch and low-reverse servo.

When the D (drive) button is pushed in, the manual valve is positioned to route line pressure to following places:

(1) The secondary reaction area of the regulator valve (making line pressure 90 psi.).

(2) The line pressure port of the throttle valve.

(3) The line pressure ports of the governor compensator valve and plug.

(4) The line pressure port of the 1-2 shift

valve and through metering hole "A" to the line pressure port of the 2-3 shift valve.

(5) Through metering hole "C" to the line pressure area of accumulator and front clutch.

(6) Through an orifice in the upper valve body plate to the rear pump circuit (to prime pump after reverse operation).

When 2 (second) button is pushed in, the manual valve routes line pressure to same places as in D (drive) and to following additional places:

(1) Through ball check valve to the kickdown pressure port of the 2-3 shift valve kickdown plug.

(2) Through ball check valve to the throttle pressure port of the shuttle valve plug.

When the 1 (low) button is pushed in, the manual valve routes line pressure to the same places as in 2 (second) and following additional places:

(1) The low pressure port of the 1-2 shift valve governor plug and through the ball check valve to low-reverse servo.

(2) Through ball check valve to kickdown pressure port of the 1-2 shift valve kickdown plug.

c. 1-2 Shift Valve

This valve determines whether the transmission is either in low gear ratio or second gear ratio, depending upon whether the valve is in the upshifted or downshifted position. The 1-2 shift valve train (consisting of three parts and a spring) is normally at either extreme of its travel. With the valve train downshifted (at the extreme of travel toward the governor compensator pressure end of the rear valve body) and oil in the kickdown servo apply area is allowed to escape through vent port.

When the shift valve train is moved to opposite extreme of its travel, the vent port is closed off and oil is fed by line pressure to the following places:

(1) 3-1 relay valve.

(2) Line pressure port of the shuttle valve.

(3) Line pressure port of the throttle compensator valve.

(4) Through servo pressure bleed valve "D" to the kickdown servo apply pressure port of the shuttle valve.

(5) The apply area of the kickdown servo.

(6) The accumulator.

(7) Line pressure port of the 1-2 shift valve kickdown plug.

The kickdown piston and accumulator are so designed that the value of the "balance pressure" is sufficient to complete a smooth band application during the time required to stop the rear clutch retainer. After completion of the 1-2 shift, the servo apply pressure rises further to the value of line pressure, providing a "safety margin" of band lead.

At light throttle (low throttle pressure), the shift valve is made to upshift at approximately 10 m.p.h. and "balance pressure" is at a low value corresponding to the small force of throttle compensator pressure on the kickdown piston. The resulting band application load is, therefore, in proportion to the light throttle engine output. At wide open throttle (90 psi. throttle pressure), the shift valve upshifts at approximately 45 m.p.h. and throttle compensator pressure is at a high value, applying the band at a load corresponding to the high engine output.

With the 1-2 shift valve train in the upshifted position, throttle pressure is not allowed to act on the end of the shift valve. Instead, any oil trapped in that area is allowed to vent through the drilled hole in the shift valve. The shift valve spring then exerts the only force on the "throttle pressure end" of the shift valve. At throttle openings less than wide open, the shift valve will downshift to breakaway when vehicle speed drops to a point where the governor compensator pressure can no longer overcome the force of the shift valve spring. This downshift occurs at a vehicle speed of approximately 10 m.p.h.

All that is required of the 1-2 shift valve for low range operation is that it must downshift below kickdown limit in response to the movement of the push button to low position and remain downshifted regardless of vehicle speed. The shift valve is forced to downshift by the application of line pressure from the low port of the manual valve around the ball check valve to the kickdown pressure port of the 1-2 shift valve kickdown plug. To insure that the shift

valve remains downshifted regardless of car speed, line pressure is also allowed to flow to the low port of the 1-2 shift valve governor plug.

It is necessary that whenever the forces of governor pressure and throttle pressure act on the shift valve to cause an upshift, the valve must "snap" from one position to the other without hesitating or "hunting". This is accomplished by a different area which is subjected to supply pressure when the valve is upshifted. When the valve is upshifted, throttle pressure is cut off so that normal downshifts are not throttle sensitive.

d. 2-3 Shift Valve

This shift valve automatically shifts the transmission from intermediate to direct gears. The 2-3 shift valve train is similar in construction and operation to the 1-2 shift valve train, in that it is controlled by governor and throttle pressures and spring force. When the valve train is in the upshifted position, oil is fed by line pressure through metering hole "A" to the following places:

(1) 3-1 relay valve.

(2) Through or around metering hole "e" (depending on shuttle valve position) to the "off" area of the kickdown servo and through the ball check valve to the rear clutch piston.

With the shift valve downshifted (at the extreme of travel toward the governor pressure end of the rear valve body) any oil in the rear clutch chamber and the kickdown servo "off" area is allowed to escape through the vent port.

e. 3-1 Relay Valve

This valve assures a 3-1 downshift. The 3-1 relay valve is a valve arranged so that the 2-3 shift valve is coupled to the 1-2 shift valve during downshift at light throttle. Under these conditions, line pressure from the 2-3 shift valve acting on the 3-1 relay valve overcomes the forces of throttle and spring pressure moving the valve to the throttle pressure end. In this position, line pressure from the 1-2 shift valve is permitted to act on the 2-3 shift valve governor plug forcing it against governor pressure to the downshift position and on the governor plug end of the 2-3 shift valve holding the 2-3 shift valve in the upshift position regardless of governor pressure.

As car speed decreases and governor compensator pressure can no longer overcome the force of the 1-2 shift valve spring, the two shift valves will downshift at the same time resulting in a smooth 3-1 downshift.

f. Kickdown Valve

The kickdown valve makes possible a forced downshift from direct to second—second to breakaway and direct to breakaway by depressing the accelerator pedal past the detent "feel" near wide open throttle.

It is desirable to limit the maximum vehicle speed at which kickdowns may be made (approximately 65 m.p.h. from drive to second and approximately 30 m.p.h. from drive or second to breakaway). The kickdown detent plug on the stem of the kickdown valve supplies the resistance necessary for a detent "feel" at kickdown. With the kickdown valve in the kickdown position, throttle pressure is routed to the following places:

(1) Through ball check valve to the 1-2 shift valve kickdown plug.

(2) Through ball check valve to the 2-3 shift valve kickdown plug.

This pressure, when applied to the end of the kickdown plugs, is great enough to make the shift valves downshift against the force of any governor, or governor compensator pressure up to the kickdown limit speeds.

22. SHUTTLE VALVE, SHUTTLE VALVE PLUG, AND SERVO PRESSURE BLEED VALVE

The shuttle valve has two separate functions and perform each independently of the other. The first is that of providing fast and smooth rear clutch engagement when the driver makes a "lift-foot" upshift from second to direct.

The "lift-foot" upshift is made by accelerating the vehicle in breakaway or second gear and then returning the accelerator pedal to closed throttle. Without the shuttle valve, the resulting upshift to direct would consist of a series of lurches, caused first by braking effect on vehicle of second gear and then by harsh engagement of rear clutch.

Under conditions of closed throttle (no throttle pressure) and moderate vehicle speed (moderate governor pressure) the shuttle valve and shuttle valve plug are forced to their extreme of travel (toward the throttle

end of the front valve body). In this position, oil is allowed to flow from the kickdown servo apply pressure port to the rear clutch pressure port and kickdown servo "off" area. Because the line pressure apply area of kickdown servo is being fed oil only through the hole in the servo pressure bleed valve, pressure on this area drops to a low value while oil from the 2-3 shift valve builds up pressure on the rear clutch and the "off" area of the kickdown servo. The kickdown band load is then reduced sufficiently to allow a smooth band release. In the meantime, pressure in rear clutch has built up sufficiently to complete a smooth engagement.

The second function of the shuttle valve is to regulate the application of the kickdown piston when making high speed (above approximately 30 m.p.h.) kickdowns. Kickdowns made at low vehicle speeds require very little time in which to complete the shift due to the comparatively small change in engine speed between direct and kickdown gear. The higher the vehicle speed at which the kickdown is made, the longer is the time required to make a smooth shift.

The force of the shuttle valve spring is great enough so that the combined force of line pressure on the shuttle valve reaction area and governor pressure (at vehicle speeds under approximately 30 m.p.h.) on the governor pressure area cannot move the shuttle valve toward the shuttle valve plug. Thus, for kickdowns below 30 m.p.h., oil is fed to the line pressure area of the kickdown servo through both the hole in the servo pressure bleed valve and the line pressure and servo pressure ports of the shuttle valve. Speed of kickdown piston application is then at its maximum.

As further insurance against the engine "running away" during low speed kickdowns, rear clutch disengagement is delayed while the kickdown piston is applying the band. This is accomplished by the introduction of a restriction (metering hole "E") placed such that oil is "backed up" into the clutch chamber as the kickdown piston moves on. This "backup" pressure is greatest on low speed kickdowns when the kickdown piston applies rapidly and is sufficient to hold the clutch applied until the kickdown band is applied. At this time, the kickdown piston can no longer force oil into the clutch and the pressure is allowed to fall to zero.

For kickdowns at higher vehicle speeds, governor pressure attains a sufficient value to move the shuttle valve toward the shuttle valve plug, cutting off the feed of line pressure to the shuttle valve. Oil must then flow to the apply pressure area of the kickdown servo only through the hole in the servo pressure bleed valve. Kickdown piston application is, therefore, retarded.

If on high speed kickdown, the servo pressure drops below the proper value (due to restricted flow through the servo pressure bleed valve hole) the drop in force of servo pressure on the shuttle valve reaction area causes the shuttle valve to move back toward the governor pressure end of the valve body, allowing enough oil to flow from the line pressure area of the shuttle valve to maintain servo pressure at the desired value during servo piston application.

23. OPERATIONAL SUMMARY

With the D (drive) button pushed in, the manual valve is positioned to give the full range of operation of the transmission. With the manual valve in the drive position, the front clutch is pressurized and the transmission will transmit drive torque in breakaway. One side of the accumulator is connected in parallel with the front clutch so that a cushioned engagement of the front clutch is obtained.

At a speed which is dependent on throttle position (approximately 10 m.p.h. at closed throttle, 25 m.p.h. at detent, 45 m.p.h. at wide open throttle), the transmission automatically upshifts to second gear. The change is initiated by movement of the 1-2 shift valve to the upshifted position so that pressure is directed to the apply side of the kickdown servo. When the kickdown band develops sufficient capacity to slow the rear clutch retainer, the overunning clutch starts to free roll, so release of the previous reaction number is automatic. The band application during the shift is controlled by action of the accumulator.

At a speed which is again dependent on throttle position (approximately 15 m.p.h. at closed throttle, 55 m.p.h. at detent, 75 m.p.h. at wide open throttle), the transmission makes an upshift to direct. This action is initiated by movement of the 2-3 shift valve. The upshift is accomplished by simultaneous disengagement of the kickdown band and engagement of the rear clutch.

Forced 3-2 shift is obtainable below approximately 65 m.p.h., and forced 3-1 shift is obtainable below approximately 30 m.p.h. Normal downshifts are not throttle sensitive and above half-throttle, they occur in sequence (3-2 at approximately 15 m.p.h. and 2-1 at approximately 10 m.p.h.). At throttle openings less than half-throttle the two shift valves are interlocked by means of the 3-1 relay valve and the shift occurs as a 3-1 relay sequence at the normal 2-1 downshift speed. This action provides a smooth downshift since the overrunning clutch is free rolling in breakaway.

Pushing the 2 (second) in, this button of the control unit moves the manual valve so that line pressure is directed to the kickdown circuit of the 2-3 shift valve. When in direct, this results in a downshift to second speed only if the vehicle speed is below 3-2 kickdown limit. If the vehicle is accelerated in second gear to the wide open throttle upshift speed, an upshift to direct will occur, thus eliminating overspeeding the engine in second gear. Operation of the 1-2 and 2-1 shift occur in the same manner as in the D (drive) position.

Pushing in the 1 (low) button of the control unit positions the manual valve so that line pressure is directed to the kickdown circuit of the 1-2 shift valve. This results in a downshift to low only if the vehicle speed is below the 3-1 kickdown limit. Use of 1 (low) is intended primarily for engine braking so it is also necessary that the low-reverse band be engaged to lock the overrunning clutch. This is accomplished by utilizing the 1-2 shift valve governor plug as a relay valve that is fed from the low port of the manual valve. A downshift force is established in connection with the relay action of the governor plug so the transmission will not upshift out of low gear while the 1 (low) button is engaged.

Pushing in the N (neutral) button moves the manual valve to a position which shuts off oil flow to the valve bodies. The torque converter and lubrication system remain pressurized.

Pushing in the **R** (reverse) button of the control unit positions the manual valve so that oil pressure is directed to apply the rear clutch and the low-reverse band. In order to transmit the high torque loads involved in reverse operation, the system pressure is raised to 225 psi. by venting of the secondary reaction area of the regulator valve.

MAINTENANCE ADJUSTMENTS AND TESTS

Checking For Oil Leaks

For lubrication requirements of the TorqueFlite Transmission, refer to the Lubrication Section of this manual. If the transmission is leaking fluid, the following points should be checked.

24. LEAKS REPAIRED WITH TRANSMISSION IN VEHICLE

a. Transmission output shaft rear bearing oil seal.

b. Extension gasket.

c. Speedometer pinion assembly in extension.

d. Oil pan to filler tube connector.

e. Oil pan to transmission case.

f. Regulator valve and torque converter control valve spring retainers. Also regulator valve adjusting screw.

g. Gearshift control cable seal and housing gasket.

h. Governor, line, lubrication and rear clutch apply pressure check plugs in transmission case or support (pressure test holes) (Fig. 40). Fittings on oil cooler lines at transmission and radiator (water cooled transmission only).

i. Neutral starting switch.

j. If oil is found inside torque converter housing, determine whether it is Automatic Transmission Fluid or engine oil. Check torque converter drain plug for tightness.

Leaks at these locations should be corrected, regardless of how slight. Correct by tightening loose screws or plugs. Where this does not remedy the situation, replace faulty gaskets, seals or plugs.

25. LEAKS REQUIRING REMOVAL OF TRANSMISSION FROM VEHICLE

a. Sand hole in transmission case.

b. Sand hole in front oil pump housing.

c. Front oil pump housing screws or damaged sealing washers.

d. Front oil pump housing oil seal.

e. Front oil pump housing seal (located on outside diameter of front oil pump housing).

f. Torque converter.

Leaks at these locations may be corrected by tightening loose bolts or replacing damaged or faulty parts.

26. MANUAL CONTROL CABLE—ADJUSTMENT

The following procedure should be used in adjusting the manual control cable for proper operation of manual lever.

a. Push in the N (neutral) push button.

b. Disconnect oil filler tube at connector on oil pan (filler tube support bracket screw may have to be loosened). Drain approximately two quarts of fluid from transmission. Reconnect filler tube. Loosen cable to transmission adjustable mounting bracket screw.

c. Remove the neutral starting switch. Place the point of a screw driver through neutral starting switch opening in transmission case and against neutral starting switch cam of manual control lever to maintain neutral position of manual lever.

d. While holding manual lever in reverse position, adjust control cable for free play by pushing in until cable stops. Mark position on cable in relation to adapter housing. Withdraw control cable to stop and measure travel. Push control cable in adapter housing one half of total travel (Fig. 39). With cable in this position, tighten cable to transmission adjustable mounting bracket screw securely. Do not move cable when tightening bracket.

e. Install neutral starting switch with cupped washer and "O" seal and attach lead wire. With transmission in neutral, adjust switch to show electrical contact, and tighten to ½ turn.

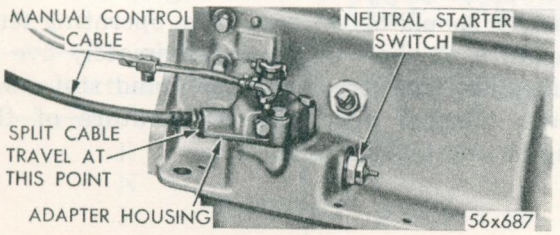


Fig. 39—Manual Control Cable Adjustment

f. To check for proper adjustment, push the various push buttons, return to neutral each time while checking the starter operation. Engine should start only when the N (neutral) push button is depressed to limit of travel. A test light attached to the neutral starter switch may be used instead of the starter for checking proper adjustment. Refill transmission with Automatic Transmission Fluid (Type A) to proper level. (Refer to Lubrication Section).

27. THROTTLE LINKAGE ADJUSTMENT (4-BARREL CARBURETOR)

Proper adjustment of the transmission throttle linkage is very important for proper operation of the transmission. Therefore, the following procedure should be very carefully performed:

Check the accelerator pedal angle to make sure it is 118° (degrees) to the horizontal. Proper pedal angle is obtained by adjusting the accelerator pedal to accelerator shaft rod length at the ball joint located on the accelerator pedal end.

Check for any binding in throttle linkage. If there is, correct this condition before proceeding. Run engine until normal operating temperature is reached, then stop. Remove air cleaner and check for choke being in a fully opened position. Connect tachometer to coil and ground. With the engine idling in neutral, adjust engine idle screw to give 475 to 500 rpm. and stop engine. Loosen the throttle linkage adjusting nut located on the rod from the accelerator shaft assembly to the intermediate shaft assembly. Move the rod rearward against idle stop of the transmission throttle cam. With rod preloaded and in line, lock throttle linkage adjusting nut and tighten to 9 foot-pounds torque. Start engine and recheck idle setting (475 to 500 rpm's) with transmission in neutral and handbrake applied. Stop engine and remove tachometer.

28. THROTTLE LINKAGE ADJUSTMENT (2-BARREL CARBURETOR)

Four barrel carburetor adjustments apply also to the 2-barrel carburetor except operations which are performed in the following manner: Loosen the throttle linkage adjusting screw (located on accelerator shaft assembly to car-

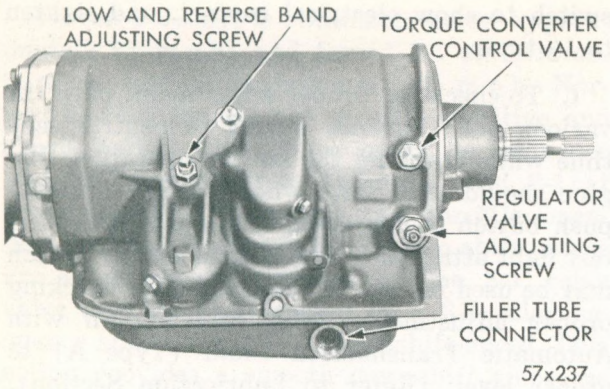


Fig. 40—Transmission Case (Right Side)

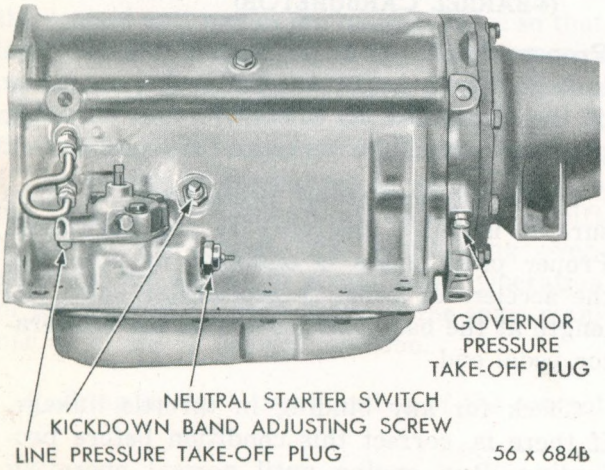


Fig. 40—Transmission Case (Left Side)

buretor rod). Move the rear portion of the accelerator to carburetor rod rearward until it is stopped by the idle stop on the transmission throttle cam. With rods in line and rear portion of rod preloaded, lock throttle linkage adjusting screw and torque to 9 foot-pounds torque.

Some vehicles may be equipped with a throttle linkage adjustment at the transmission throttle operating lever. The purpose of this adjustment is to allow for variations between chassis and engine assemblies in the manufacturing of different models and should not be used for making the throttle linkage adjustment.

29. TRANSMISSION BANDS

a. Kickdown Band (Front)

The kickdown band adjusting screw is located on the left side of the transmission case, as shown in Figure 40. Using a ¾ inch wrench, loosen the locknut. Check the freeness of the adjusting screw in the transmission case. If free, use inch-pound torque-wrench, Tool C-338 (with extension Tool C-3583). Because of the added leverage afforded by extension Tool C-3583, set the click device on the indicator at 47-50 inch-pounds, then tighten adjusting screw to this torque. (Disregard multiplication factor notation on extension Tool C-3583). Using a reference mark of chalk or colored pencil on the corner of the adjusting screw square and the transmission case, back the adjusting screw out exactly 3½ turns. While holding the adjusting screw stationary, tighten the locknut and torque from 35 to 40 foot-pounds torque. **Care must be exercised in performing this operation.**

b. Low-Reverse (Rear) Band

The low-reverse band adjusting screw is located on the right side of the transmission, as shown in Figure 40. Using a ¾ inch wrench, loosen the locknut. Check the freeness of the adjusting screw in the transmission case. If free, use inch-pound torque wrench, Tool C-3380 (with extension Tool C-3583). Because of the added leverage afforded by the extension Tool C-3583, set the clock device on the indicator at 47-50 inch-pounds, then tighten adjusting screw to the torque. Using a reference mark of chalk or colored pencil on the corner of the adjusting screw square and the transmission case, back the adjusting screw out exactly 2⅝ turns. While holding the adjusting screw stationary, tighten the locknut to 40 foot-pounds torque. **Care must be exercised in performing this operation.**

c. Road Testing

First check the transmission fluid level and engine idle. Good transmission operation depends on good engine operation. Make sure the engine is operating at full efficiency. **If when tuning the engine, the throttle linkage between the carburetor and the transmission is disturbed, it will be necessary to readjust the linkage.** Before attempting to diagnose or correct the transmission operation, the engine and transmission should be warmed up to operating temperature. A short drive, approximately five to ten miles, with frequent starts and stops will create normal operating temperature of the engine and transmission.

CAUTION

Do not stall test the torque converter. For safe-

ty reasons and because damage to the transmission may result, wide open throttle stall operation is not recommended.

Engage the N (neutral) button and check for dragging up to an engine speed of 800 r.p.m. Push in the R (reverse) button and note the shift time and smoothness of the shift. Back the car up and check for dragging. Push the D (drive) button and note the shift time and smoothness of engagement. Accelerate the car at very light throttle. The transmission should upshift into second at approximately 7 to 11 mph. and into direct at approximately 11 to 15 mph. Check the quality of the shifts.

Slow the car to approximately 15 mph., then depress the accelerator pedal quickly to wide open throttle (without going into kickdown). Check for slippage of the front and rear clutches. The transmission should not downshift at this time. At a car speed of approximately 25 to 32 mph. depress the accelerator pedal fully. The transmission should downshift to breakaway gear. Check the quality of the shift.

Release the accelerator pedal and allow the transmission to upshift. Accelerate the car to 51-64 mph. Depress the accelerator pedal fully. The transmission should downshift to second gear. Check the quality of the shift. Release the accelerator pedal to closed throttle. Check the quality of the "lift-foot" upshift. Accelerate the car to 60 mph. and depress the accelerator pedal fully. The transmission should downshift to second gear. Check the quality of the shift.

Accelerate the car in kickdown (second gear) at wide open throttle until the transmission upshift. The shift should occur at approximately 70 mph. Check the quality of the shift. Slow the car down to 25 to 32 mph. and engage the 2 (second) button. The transmission should downshift to second gear. Check for gear noise. Slow the car to 15 mph. and depress the accelerator pedal quickly to wide open throttle without going into kickdown. Check for kickdown band or front clutch slippage. The transmission should not downshift at this time.

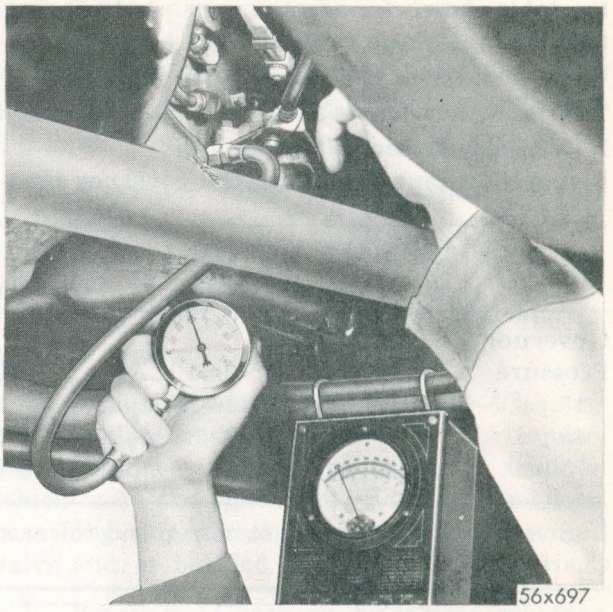


Fig. 41—Checking Line Pressure

Release the accelerator pedal and push in the L (low) button. The transmission should downshift at approximately 25 mph. With the accelerator pedal at light throttle, push the D (drive) button at approximately 15 mph. (the transmission will upshift.) Coast to a stop. The transmission should downshift at 6-10 mph. Check the quality of the downshift.

30. HYDRAULIC CONTROL PRESSURE CHECKS

a. Line Pressure

Remove the pipe plug from the line pressure takeoff hole located on the left side of the transmission case (Fig. 40). Install gauge, Tool C-3293 (300 psi.) at this point (Fig. 41). If line pressure is not correct, it may be adjusted by loosening the lock nut on the adjusting screw (Fig. 40) and turning the adjusting screw clockwise to increase or counter-clockwise to decrease line pressure. All line pressure adjustments should fall within the limits specified in

LINE PRESSURE CHART

Push Button Position	Rear Wheels	Engine Speed (rpm)	Line Pressure (psi)
R	Free to Turn	1600	200—250
N	....	800	85— 95
D	Free to Turn	800	90
2	Free to Turn	800	85— 95
1	Free to Turn	800	85— 95

the table shown for all other push button positions. If the line pressure cannot be satisfactorily adjusted, check "Trouble Diagnosis Chart."

b. Governor Pressure (Fig. 42)

Remove the pipe plug from the governor pressure take-off hole located on the lower left side of the output shaft support (Fig. 40). Install gauge, Tool C-3292 (100 psi.) at this point. With car in D (direct drive) and rear wheels free to turn, refer to the following chart:

	C75-1, 2 C76	C75-1, 2 C76	C76	IM-1	IM-1	IM-1
Governor Pressure	3.18 R.A.	3.36 R.A.	2.92 R.A.	2.92 R.A.	3.18 R.A.	3.36 R.A.
15 psi.	17-19 mph.	16-18 mph.	19-21 mph.	19-21 mph.	18-20 mph.	17-19 mph.
45 psi.	32-39 mph.	29-36 mph.	35-42 mph.	36-43 mph.	33-40 mph.	31-37 mph.
75 psi.	66-71 mph.	63-67 mph.	73-79 mph.	74-80 mph.	68-74 mph.	64-70 mph.

If governor pressure does not correspond to car speeds, check line pressure and the "Trouble Diagnosis Chart".

c. Rear Clutch Apply (Fig. 43)

Remove pipe plug from the rear clutch, apply pressure take-off hole located on the output shaft support (Fig. 40). Install gauge Tool C-3293 (300 psi.), as shown in Figure 43. The rear clutch circuit is pressurized in D (drive) position, direct and in the R (reverse) position. The rear clutch circuit pressure should be checked simultaneously with line pressure. The rear clutch apply pressure should not be less than a value of 15 psi. lower than line pressure (90 psi. in direct and 200-250 psi. in reverse). If the rear clutch pressure is not correct investigate the "Trouble Diagnosis Chart".

d. Lubrication Pressure

Remove the pipe plug from the lubrication pressure take-off hole located on the left side of the transmission case (Fig. 40). Install gauge, Tool C-3293 (300 psi.) at this point. With engine running at 800 r.p.m. in neutral, lubrication pressure should be approximately 10 to 30 psi. If the pressure is incorrect, check line pressure and the "Trouble Diagnosis Chart".

If the pressure is extremely high (above 50 psi.), it is a good indication that there is a restriction due to dirt or foreign matter in the lubrication passages.

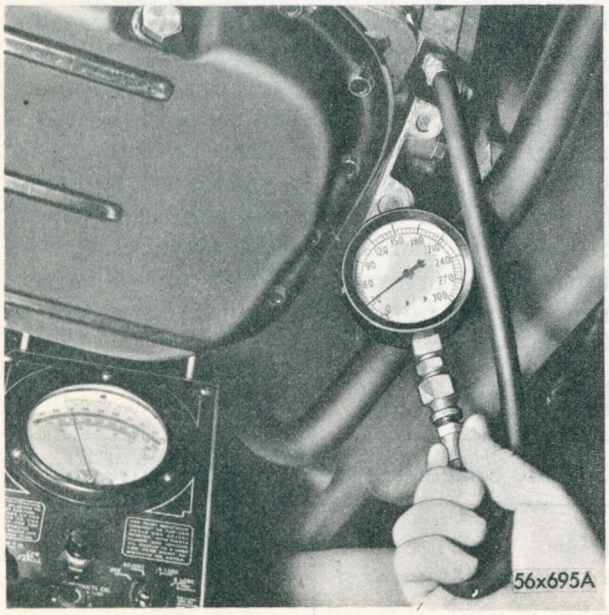


Fig. 42—Checking Governor Pressure

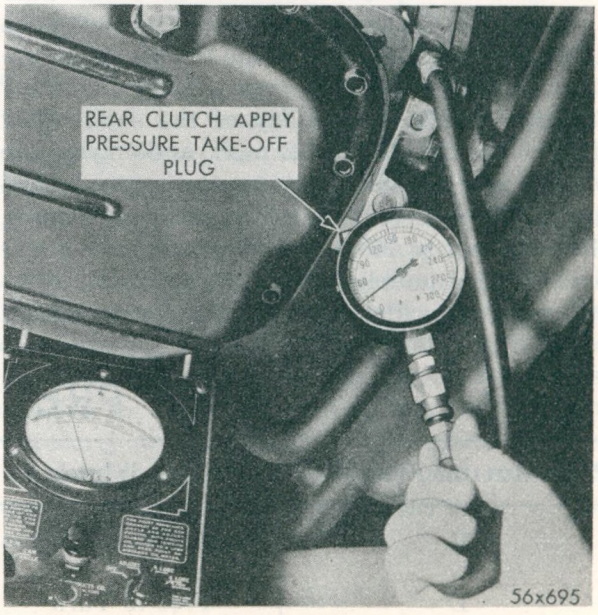


Fig. 43—Checking Rear Clutch Apply Pressure

TROUBLE DIAGNOSIS CHART

The Trouble Diagnosis Chart has the operating difficulties listed in three groups. After road testing, match the trouble found to its particular group and to the specific difficulty under that group. The Index and Item in the "Items to Check" column are next checked against the "Explanation of Index Items". Capital letter items refer to those operations which may be performed without removing the transmission. The small letter items refer to those operations done after removal of transmission from car.

Never remove a transmission from a car until all the possible "in car" causes have been checked for the operating difficulty and the oil pan has been removed to check for dirt, metal chips, band material, broken band ends, and burned or scored band contacting surfaces. Also, check the manual control cable and throttle linkage for adjustment and wear.

31. EXPLANATION OF INDEX ITEMS

A. **Oil level**—Refer to Lubrication Section of this manual.

B. **Throttle linkage**—Adjust to Specifications.

C. **Gearshift control cable**—Adjust to Specifications.

D. **Pressure tap check**—Hydraulic pressure taps have been provided to check the following pressures: line, lubrication, governor and rear clutch apply. These pressures should fall within the specified limits stated in the Hydraulic Control Pressure Check Charts.

E. **Kickdown band adjustment**—The kickdown band adjustment screw is found on the left side of the transmission case (Fig. 39) Adjust to specifications.

F. **Low and reverse band adjustment**—The low and reverse band adjustment screw is found on the right side of the transmission case. (Fig. 40). Adjust to specifications.

G. **Engine Idle**—Adjust to 475 to 500 r.p.m.

H. **Starting switches**—Check wire, connections and switch. Check clearance of N (neutral) push button slide to motor starting switch, contact clearance. (Fig. 48)

I. **Handbrake**—Check for excessive drag. Refer to Brakes Section for method of adjusting hand brake.

J. **Regulator valve, spring**—The regulator valve may be removed by removing the regulator valve spring retainer which is on the right side of the transmission case (Fig. 40). Check for a stuck or scratched valve and/or buckled spring.

K. **Converter control valve, spring**—The converter control valve may be removed by removing the converter control valve spring retainer which is on the right side of the transmission case (Fig. 40). Check for a stuck or scratched valve and/or buckled spring.

L. **Breather**—Check to determine whether breather is free of dirt and undercoating.

M. **Output shaft rear bearing, snap ring**—Check for rough bearing and/or unseated snap ring and correct thickness snap ring.

N. **Torque converter housing cooling air passages**—Check for dirt, mud, or other foreign material on screens or on torque converter cooling fins.

O. **Kickdown servo, band and linkage**—Check for broken seal rings, stuck servo piston or broken linkage.

P. **Low and reverse servo, band and linkage**—Check for torn seal, broken band and/or linkage.

Q. **Oil strainer**—Check for possible air leakage.

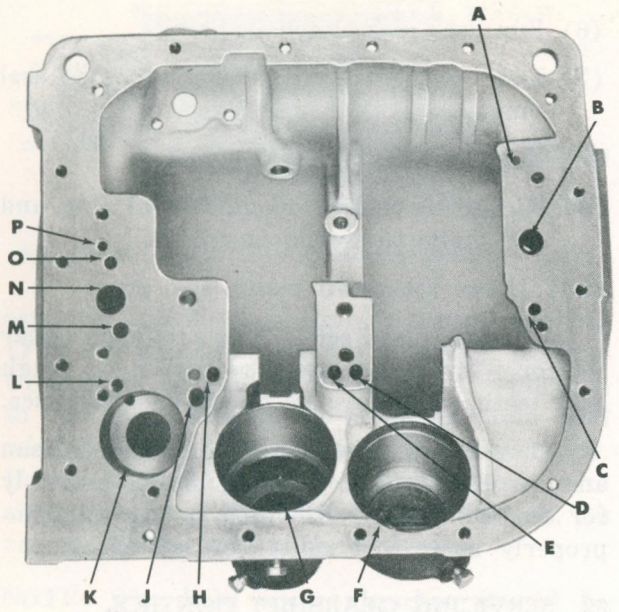
R. **Valve body attaching bolts and mating surface**—Check for loose bolts, burrs or scratches on mating surfaces. Clean valve body assembly. Check for stuck valves, dirt, scratched valves or body, and burrs on valves. Torque valve body bolts to specification.

S. **Accumulator**—Check accumulator cover screw tightness and piston for broken rings. Torque accumulator cover screws to specifications.

T **Air pressure checks**—The front clutch, rear clutch, kickdown servo, governor and low and reverse servo may be checked by applying air pressure to their respective passage when the valve body is removed. To make the com-

TROUBLE DIAGNOSIS CHART

ITEMS TO CHECK — See "Explanation of Index Items" — INDEX / ITEM	OPERATING DIFFICULTY: Shift Abnormalties: Harsh N to D or N to R	Shift Abnormalties: Delayed N to D	Shift Abnormalties: Runaway on Upshift and 3-2 K.D.	Shift Abnormalties: Harsh Upshift and 3-2 K.D.	Shift Abnormalties: No Upshift	Shift Abnormalties: No K.D. or Normal Downshift	Shift Abnormalties: Shifts Erratically	Response: Slips in Forward Drive Position	Response: Slips in L-R Only	Response: Slips in All Positions	Response: No Drive in Any Position	Response: No Drive in Forward Ranges	Response: No Drive in R.	Response: Drives in N	Miscellaneous: Drags or Locks	Miscellaneous: Grating, Scraping, Etc. Noises	Miscellaneous: Buzzing Noises	Miscellaneous: Trans. Hard to Fill—Oil Blows Out Fill Tube	Miscellaneous: Trans. Overheats	Miscellaneous: Impossible to Push	Miscellaneous: Starter Won't Energize
A. Oil Level		●	●		●	●	●	●		●	●						●	●	●	●	
B. Throttle Link Adj.			●	●	●	●	●														
C. Gearshift Control Cable Adj.						●	●							●							●
D. Pressure Checks, Line Lube, etc.	●	●	●	●	●	●	●	●	●	●	●	●	●							●	
E. K. D. Band Adj.			●	●	●	●						●			●				●		
F. Low-Reverse Band Adj.	●								●				●		●				●	●	
G. Engine Idle	●						●														
H. Starting Switches																					●
I. Handbrake Adj.															●	●			●		
J. Regulator Valve-Spring							●			●	●						●	●	●		
K. Converter Control Valve																	●	●	●		
L. Breather																		●			
M. Output Shaft Rear Bearing S. R.							●									●					
N. T. C. Cooling																			●		
O. K. D. Servo Band-Linkage			●	●	●	●						●			●						
P. L.-R. Servo, Band-Linkage	●								●				●		●					●	
Q. Oil Strainer							●				●							●			
R. Valve Body—Bolts Mating Surfaces		●	●	●	●	●	●	●	●	●	●	●		●						●	
S. Accumulator	●	●	●	●	●	●		●				●									
T. Air Pressure Check		●	●		●	●	●	●	●	●	●	●	●								
U. Governor					●	●	●									●					
V. Rear Pump																●			●	●	
a. Front Pump—Drive Sleeve		●					●			●	●					●			●	●	
b. Reg. Valve Body, Gasket, Surfaces								●	●	●	●						●	●	●		
c. Converter																					
d. Front Clutch	●	●						●				●		●	●	●			●		
e. Rear Clutch	●		●	●	●			●				●	●		●	●			●		
f. Planetary Gear Set															●	●					
g. Overrunning Clutch						●		●				●			●						



A—GOVERNOR PRESSURE
B—REAR PUMP INLET
C—REAR CLUTCH 'APPLY' (Line pressure)
D—LOW AND REVERSE SERVO 'APPLY' (Line pressure)
E—KICKDOWN SERVO 'APPLY' (Throttle compensated pressure)
F—LOW AND REVERSE SERVO (Location)
G—KICKDOWN SERVO (Location)
H—KICKDOWN SERVO 'APPLY' (Line pressure)
J—KICKDOWN SERVO 'RELEASE' (Line pressure)
K—ACCUMULATOR (Location)
L—FRONT CLUTCH AND ACCUMULATOR 'APPLY' (Line pressure)
M—LINE PRESSURE
N—FRONT PUMP INLET
O—REVERSE UPSET (Reverse blocker 'Apply') (Line pressure)
P—LINE PRESSURE GAUGE 56x712A

Fig. 44—Oil Passages in Transmission Case

plete air pressure check proceed as follows: (Fig. 44.)

CAUTION

Compressed air supply must be free of all dirt and moisture.

Raise the vehicle on a hoist, drain the transmission fluid, and remove the transmission oil pan. Remove the accumulator cover and valve bodies assembly. Apply air pressure to the front clutch passage, located slightly toward the center of the transmission from the accumulator (be sure to cover accumulator piston base to prevent piston from being blown out). Protect yourself from oil spray by holding a clean lintless cloth, cardboard, or some other shield against the bottom of the transmission case when applying the air pressure. Listen for a dull "thud" which indicates that the front clutch is operating. Hold the air pressure on for a few seconds and observe for excessive oil leaks in the system.

Apply air pressure to the rear clutch passage (near the center rear end of the lower surface of the transmission case). Listen for a dull "thud" which indicates that the rear clutch is operating. Also check for excessive oil leaks.

Apply the air pressure to the kickdown "apply" (line) pressure passage (toward the center of the transmission case and to the front of the kickdown servo). Observe the operation of the kickdown servo, lever and band when air pressure is applied.

Apply air pressure to kickdown "apply" (compensated throttle) pressure passage (toward the center of the transmission case and to the rear of the kickdown servo). Observe the operation of the kickdown servo.

Apply air pressure to the low and reverse servo passage (toward the center of the transmission case and to the front of the low and reverse servo). Observe the operation of the low and reverse servo, lever, and band, when air pressure is applied.

Apply air pressure to the line pressure passage (M, Fig. 44). Rotate the propeller shaft slightly to bring the governor flyweight down while applying the air pressure. Operation of the governor will be indicated by a sharp "click" when air pressure is applied.

If the clutches, servos and governor operate properly, "no drive" conditions as well as erratic or no upshift conditions, indicate that the malfunctioning exists in the control valve body assembly. Disassemble, clean, inspect and service the valve body assembly as described in the "Reconditiong of Valve Body and Transfer Plate Assemblies," Paragraph 38.

Upon completion of the air pressure check, and servicing the valve body assembly, install the valve body assembly, accumulator cover, and transmission oil pan. Fill the transmission to proper level with fluid, and adjust the control cable and throttle valve linkage.

U. **Governor**—Clean assembly, and check weight assembly and valve for burrs, scratches or sticky operation. Examine the governor valve shaft, shaft snap rings and seal rings.

V. **Rear pump**—Clean and inspect assembly for side and diametral clearance. Note whether rear oil pump pinion ball is in place. Examine output shaft support face for scoring.

a. Front pump—Drive sleeve—Clean and inspect assembly for side and diametral clearance. Examine oil pump inner and outer rotor for scoring. Check front pump drive sleeve seal rings.

b. Regulator valve body, mating surfaces, gasket—Clean and inspect valve body for scratches and scoring on valve bores and face which bears against the front pump housing. Examine the valve body to determine if the secondary reaction orifice is free of dirt. Check gasket for uniformness of compression by valve body.

c. Converter—Flush out converter and check converter to housing runout. (Refer to Torque Converter of this Section).

d. Front clutch—Clean and inspect discs, plates, drive hub, return spring piston levers, cushion spring and retainer. Check the following front clutch circuit leakage possibilities.

(1) Valve body and valve body to case mating surface.

(2) Accumulator small and large piston rings.

(3) Regulator valve body to case mating surface.

(4) Torque converter reaction shaft seal ring.

(5) Input shaft small and large seal rings.

(6) Intermediate shaft number 1, 2, and 3 seal rings.

(7) Front clutch oil feed tube.

(8) Front clutch piston inner and outer seal ring.

(9) Front clutch check valve ball.

e. Rear clutch—Clean and inspect discs, plates, return spring and piston. Check the following rear clutch circuit leakage possibilities.

(1) Valve body and valve body to case mating surface.

(2) Output shaft support to case mating surface.

(3) Output shaft small and large seal rings.

(4) Intermediate shaft No. 4, 5, and 6 seal rings.

(5) Rear clutch oil feed tube.

(6) Sun gear rear clutch seal rings.

(7) Rear clutch piston inner and outer seal rings.

(8) Rear clutch check valve ball.

(9) Kickdown piston rod guide seal ring and rod guide to kickdown rod fit.

(10) Large kickdown piston seal ring.

f. Planetary gear set—Clean and inspect gear set for worn thrust washers nicked or rough gear teeth, and excessive pinion and clearance.

g. Low-Speed Over-running clutch—Clean and inspect the over-running clutch assembly for the brinnelled rollers and/or cam and improperly assembled rollers or springs.

32. SERVICING GEARSHIFT CONTROL HOUSING

a. Removing Gearshift Control Housing

Remove the four screws, holding gearshift housing and plate assembly to instrument panel. One screw at top front of plate, one screw at front left edge of plate and two screws at bottom (rear) of plate. Pull plate and gearshift control housing assembly straight out and down from instrument panel, as shown in Figure 45. If housing is equipped with a back-up light switch, exercise care when removing plate so as not to damage switch. Remove two retaining screws (Fig. 45) securing gearshift housing to plate and remove plate by carefully withdrawing from push buttons.

Remove hairpin clip securing cable end to actuator. Remove the two screws holding cable

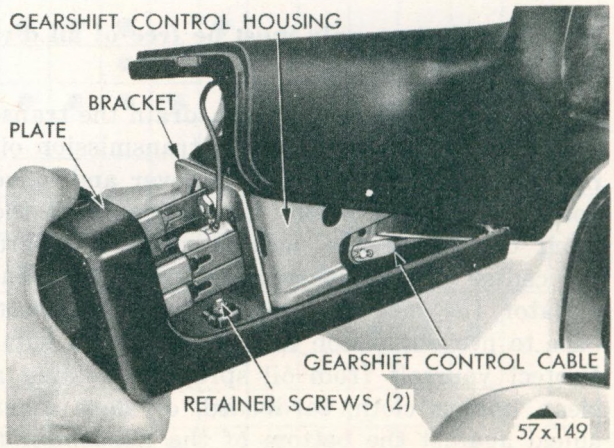


Fig. 45—Removing Gearshift Control Housing

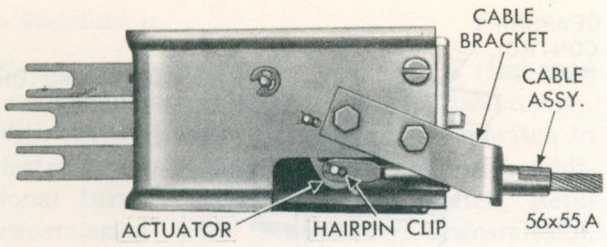


Fig. 46—Gearshift Control Housing (Exterior View)

assembly bracket to gearshift control housing (Fig. 46) and remove cable assembly. Remove wires from back-up light switch—if vehicle is so equipped. Remove illuminating lamp lead wire. Remove leads from starting motor switch. If necessary to remove push buttons from slides, withdraw by pulling on the buttons. Do not spread the slide tangs or fingers.

NOTE: The light socket bracket should be mounted between the push button box and the box mounting bracket. The wire should be located in the light socket bracket key slot and be routed directly up and over towards the center of the car. The box upper mounting bolt with the wire retained in the recess between the box and its mounting.

b. Installing the Gearshift Control Housing

Install end of control cable on actuator and install hairpin clip (Fig. 46). Place cable bracket in position on gearshift control housing, install two screws and tighten securely. Reconnect back-up light switch wires (if so equipped). Reconnect illuminating lamp lead. (Check wire routing as noted in disassembly). Reconnect starting motor switch leads. If push buttons were removed, slightly compress fingers on slides (if necessary) to aid in retention of push buttons. Place gearshift control housing assembly in position on plate, as shown in Figure 45, and secure with the two retainer screws.

Carefully guide plate and gearshift housing assembly back into position in instrument panel and secure with four screws. If housing is equipped with back-up light switch, exercise care during positioning of plate in instrument panel to avoid damaging switch. Adjust gearshift control cable as outlined in "Maintenance Adjustments and Tests", Paragraph 24.

c. Removing Gearshift Control Cable

Engage L (low) button to place spring lock

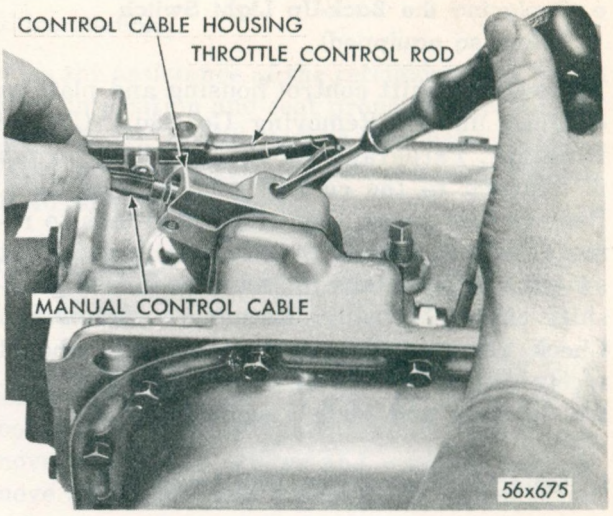


Fig. 47—Releasing Manual Control Cable Spring Lock

in line with control cable adapter plug hole in transmission case. Remove the gearshift control unit from the instrument panel as outlined under "Removing Gearshift Control Housing", Paragraph 32. Remove cable adjustable mounting bracket on transmission. Remove control cable adapter housing plug, insert screw driver through hole, and release the control cable spring lock, as shown in Figure 47. While releasing the spring lock, remove cable. Using the same screw driver, insert through cable hole in adapter housing and push lever rearward to last detent. Reinstall housing plug and tighten. From front of dash, pull cable assembly and rubber grommet from dash panel.

d. Installing and Adjusting Gearshift Control Cable

Place grommet on cable. From front of dash, install control housing end of cable through dash panel. Install gearshift control unit as outlined under "Installing Gearshift Control Housing," Paragraph 32. Install cable grommet into dash panel.

Remove oil pan. Remove neutral starting switch from transmission case (Fig. 40). Position manual valve lever in **low** range detent. Hold the R (reverse) push button in at full travel position. Insert cable into transmission manual lever adapter until spring lock engages control cable securely. Release the R (reverse) button and hold the N (neutral) push button in. Adjust cable as outlined under "Manual Control Cable—Adjustment", Paragraph 26.

e. Replacing the Back-Up Light Switch (when so equipped)

Remove gearshift control housing and plate as outlined under "Removing Gearshift Control Housing", Paragraph 32. Back-up light switch is fastened to the control unit by four tabs. Remove lead wires, then straighten tabs to remove switch. Install repaired or replacement switch and bend tabs to secure switch to gearshift control housing. Reconnect lead wires. Check reverse slide operation—slide should freely return full travel. Install gearshift control housing and plate assembly.

f. Replacing Push Button Unit Lamp Bulb

Remove the gearshift control housing and plate as outlined under "Removing Gearshift Control Housing", Paragraph 32. Remove one or more push buttons for clearance. Replace defective or burned out bulb. Replace gearshift control housing and plate assembly. Test operation of unit.

g. Replacing Starting Motor Switch

Remove gearshift housing and plate assembly as outlined under "Removing Gearshift Control Housing", Paragraph 32.

Remove starting motor switch by drilling out rivets. Mount replacement switch on gearshift control housing and secure by riveting or using suitable screws, lockwashers and nuts. **Be sure that sufficient clearance is maintained for free movement of operating slide ends, if screws are used.** Push button operating slide

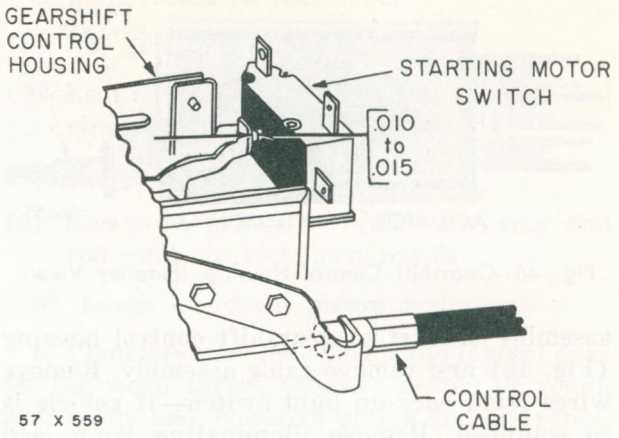


Fig. 48—Push Button Operating Slide to Starting Motor Switch Clearance

to starting motor switch clearance is obtained by depressing the N (neutral) push button to the **neutral** position **only** and depressing only far enough beyond **this** point to remove **all** free movement from the actuator. Clearance between slide and motor starting switch contact should then be between .010-.015 inch. (Fig. 48.)

If clearance is not within this specification, the tab on the neutral operating slide may be adjusted by carefully bending to bring within specifications. **Use care as the operating slide is of hardened material and may break if care is not exercised during the bending operation.** Test operation of unit, using a suitable test lamp. Reinstall gearshift control housing and plate assembly as outlined in "Installing Gearshift Control Housing", Paragraph 32.

SERVICING OF COMPONENT PARTS WITH TRANSMISSION IN VEHICLE

33. SPEEDOMETER PINION

a. Removal

Disconnect speedometer cable and housing from drive pinion and sleeve assembly in transmission. Remove speedometer pinion and sleeve assembly from transmission extension.

b. Installation

Install speedometer pinion and sleeve assembly in transmission extension and tighten to 45 foot-pounds torque. Connect speedometer cable and housing to drive pinion and sleeve assembly in transmission and tighten.

34. NEUTRAL STARTING SWITCH

a. Removal

Drain approximately two quarts of fluid from transmission by disconnecting filler tube at oil pan connector, (may be necessary to loosen filler tube support bracket screw). Remove wire at switch. Remove switch and gasket.

b. Installation

Place cupped spring washer and "O" ring over switch and install switch in transmission case. With transmission in neutral, adjust switch to electrical contact, and tighten 1/3 to 1/2 additional turns. Connect wire to switch. Refill transmission with Automatic Transmission Fluid (Type A) to proper level after reconnecting filler tube at oil pan.

35. TRANSMISSION REGULATOR VALVE ASSEMBLY

a. Removal

Remove transmission regulator valve spring retainer, gasket, cup spring and sleeve. Using a mechanical retriever or a piece of welding rod (5/32") inserted in end of valve, remove valve (Fig. 49).

b. Installation

With the assistance of the retrieving tool, place valve in position and seat properly in regulator valve body. Install regulator valve spring, sleeve, cup, gasket and retainer and tighten to 50 foot-pounds torque. Check and adjust line pressure—if necessary.

36. TORQUE CONVERTER CONTROL VALVE ASSEMBLY

a. Removal

Remove the torque converter control valve spring retainer (Fig. 40) gasket and spring. Using a mechanical retriever or a piece of welding rod (1/8") inserted in end of valve, remove valve.

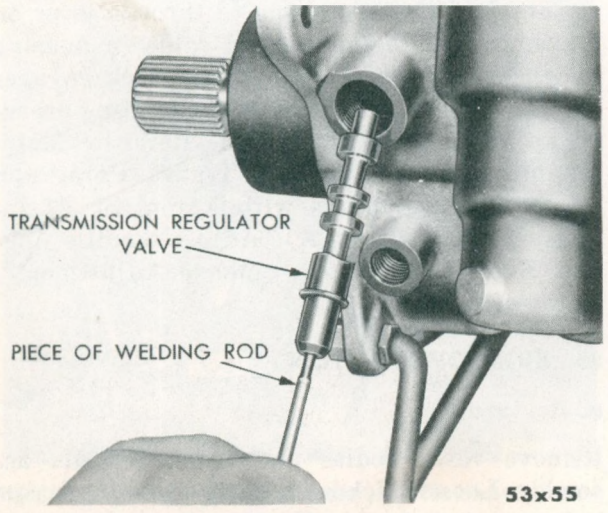


Fig. 49—Removing Regulator Valve

b. Installation

With the assistance of the retrieving tool, place valve in position and seat properly in regulator valve body. Install torque converter control valve spring, gasket, and retainer, and tighten to 40 foot-pounds torque.

37. OIL PAN

a. Removal

Drain transmission by disconnecting filler tube connector at oil pan. It may be necessary to loosen filler tube support bracket screw. Remove the oil pan screws and washers, and remove the oil pan and gasket from transmission case.

b. Installation

Using a new oil pan gasket, place oil pan into position on transmission case. Install oil pan screws and washers drawing them down evenly and tighten to 17 foot-pounds torque. Install oil pan filler tube, and tighten nut connector to 40 foot-pounds torque. Tighten support bracket screw. Refill transmission with Automatic Transmission Fluid (Type A).

38. VALVE BODIES AND TRANSFER PLATE ASSEMBLY

a. Removal

Place push button control unit in 1 (low) position.

NOTE: It will be necessary for control cable adapter to be in this position when removing cable from adapter housing on transmission.

Remove oil pan. Disconnect throttle linkage from throttle lever on transmission. Remove all dirt and foreign material from around control cable housing. Loosen throttle control lever screw and remove lever assembly. Remove flat washer and felt seal from throttle lever shaft. Remove control cable adjustable mounting bracket. Remove control cable adapter housing plug, insert screw driver through hole, and release the control cable spring lock. While releasing control cable spring lock, remove cable. Using same screw driver, insert through cable opening in adapter housing and push lever rearward to last detent. Reinstall housing plug and tighten.

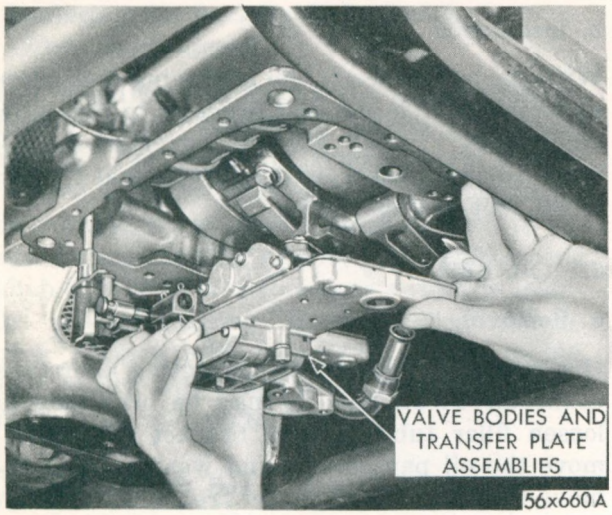


Fig. 50—Removal and Installation of Valve Bodies and Transfer Plate Assembly

Remove the three control cable housing screws and washers. Remove control cable housing and gasket. Loosen manual valve control lever screw and slide lever off shaft. Remove the four oil strainer assembly screws and washers and remove oil strainer assembly. Loosen (to relieve spring load) and remove the three accumulator cover screws with washers. Remove cover and spring from transfer plate. Remove the three transfer plate screws and washers and remove valve bodies and transfer plate assembly from transmission case (Fig. 50).

b. Installation

Clean mating surfaces and check for burrs on both the transmission case and valve body transfer plate. Install valve bodies and transfer plate assembly on transmission case. Install the three transfer plate screws and washers two in center and one in front. Draw down evenly and tighten to 16 foot-pounds torque.

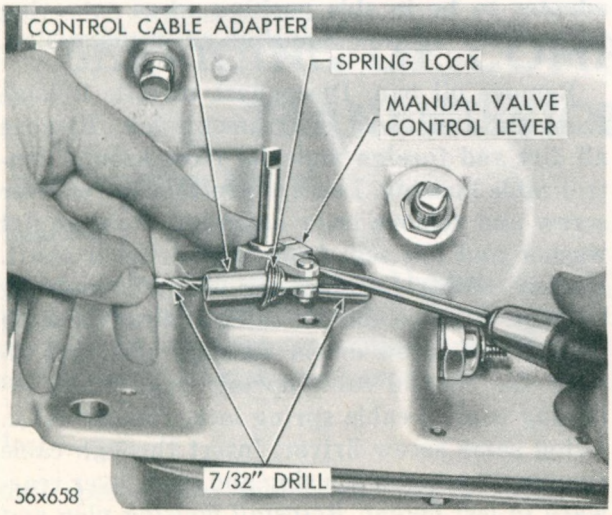


Fig. 51—Setting Manual Valve Control Lever Clearance

CAUTION

Dished type washers are used to prevent cutting or chipping of soft metals and should be installed on screws with dished portion facing away from head.

Install accumulator spring through transfer plate and position in piston. Install accumulator cover, three screws, and washers; draw down evenly. Place oil strainer in position on transfer plate assembly. Install the four screws and washers. Draw down evenly and tighten strainer and accumulator cover screw to 16 foot-pounds torque. Install oil pan. Install manual valve control lever (locking screw to rear) on manual valve lever shaft. Position lever on shaft so there is $\frac{7}{32}$" clearance (without gasket) between lever and transmission case.

NOTE: A 7/32" drill bit can be used for obtaining proper clearance (Fig. 51). Tighten locking screw securely.

If control cable adapter has been removed from manual valve control lever, reinstall by positioning in lever (end of spring lock up), and installing pin. Place manual valve control lever in reverse position (last detent to rear) and install gasket, control cable housing, and screws and washers. Draw down evenly and tighten to 16 foot-pounds torque. Install felt washer, flat washer, and throttle lever control assembly. Tighten clamping bolt.

Connect throttle linkage to throttle lever on transmission. Install control cable in housing and adapter making sure spring lock engages cable. Replace cable adjustable mounting bracket. Adjust manual control cable. Refer to "Maintenance, Adjustments and Tests", Paragraph 24. Refill transmission with Automatic Transmission Fluid (Type A). Adjust throttle linkage. Refer to "Throttle Linkage Adjustment", Paragraph 27.

39. KICKDOWN PISTON

a. Removal

Remove valve bodies and transfer plate assembly. Loosen kickdown band adjusting screw lock nut and back adjusting screw out suf-

ficiently to remove anchor. Remove kickdown band strut. Install Tool C-3529 or C-3289, (modified as shown in Figure 84), apply sufficient pressure on the kickdown piston rod guide, and remove the snap ring. Loosen compression portion of tool and remove piston rod guide, piston spring, and piston rod. Using C-484 pliers, remove the kickdown piston from transmission case (Fig. 52). Refer to "Kickdown Piston Inspection" under "Reconditioning Transmission", Paragraph 46.

b. Installation

Lubricate piston rings and place kickdown piston assembly into position, compress outer ring, and start assembly into case. With piston properly centered so not to damage rings, tap lightly and bottom piston into transmission case. Slide piston spring over kickdown piston rod assembly and install in piston. While holding in position, install the kickdown piston rod guide assembly on kickdown piston rod.

Using Tool C-3529 or C-3289 (modified) and extreme care, compress the kickdown piston spring to the point that piston guide seal ring slightly binds on transmission case. Work seal ring into position and gradually compress spring until seal ring enters case and snap ring can be installed (Fig. 53). Install kickdown piston rod guide snap ring, making sure it is properly seated. Loosen compressing portion of tool and remove tool from transmission case. Place kickdown band strut in position in band and lever, and compress band end sufficiently to install anchor over adjusting screw. Adjust kickdown band as outlined under "Maintenance Adjustments and Tests", Paragraph 24. Install valve bodies and transfer plate assembly.

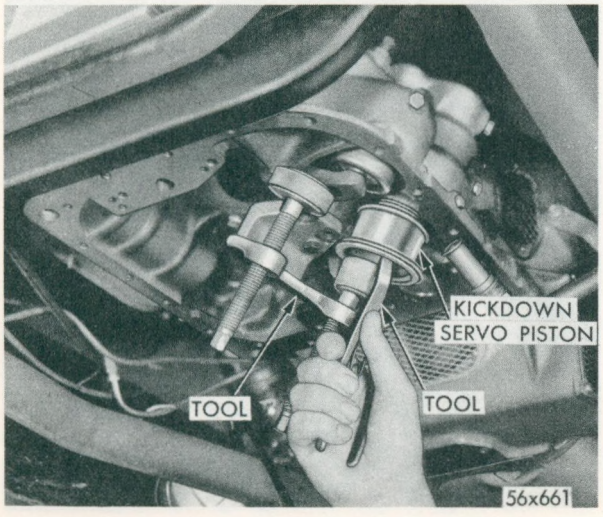


Fig. 52—Removal and Installation of Kickdown Piston (Typical View)

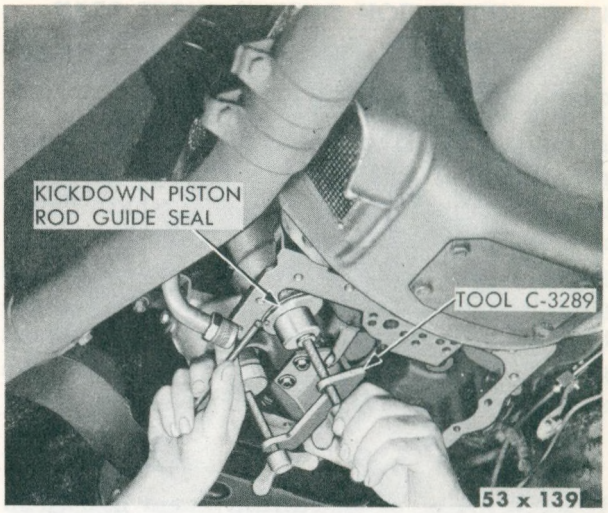


Fig. 53—Positioning Kickdown Piston Rod Guide Seal (Typical View)

40. ACCUMULATOR PISTON

a. Removal

Remove valve bodies and transfer plate assemblies. Using Tool C-484, remove accumulator piston from transmission case, as shown in Figure 54. Refer to Accumulator Piston—Inspection, as outlined in "Reconditioning Transmission", Paragraph 46.

b. Installation

Lubricate seal rings and place accumulator piston into position. Compress outer seal ring and tap lightly into transmission case. Install valve bodies and transfer plate assemblies.

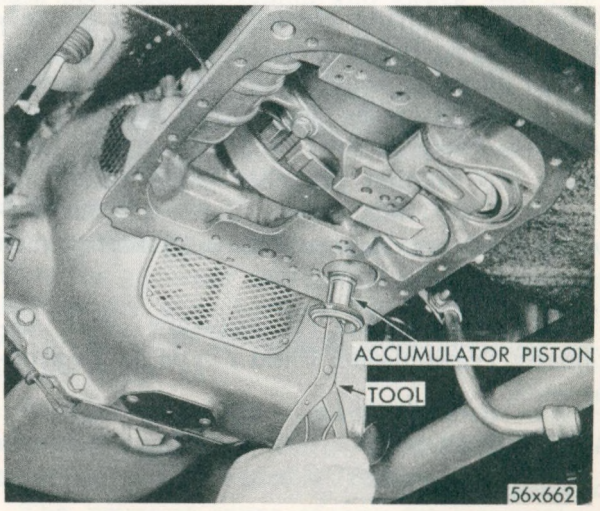


Fig. 54—Removal and Installation of Accumulator Piston (Typical View)

41. TRANSMISSION OUTPUT SHAFT REAR BEARING OIL SEAL

a. Removal

Disconnect the front universal joint and secure propeller shaft out of the way. Apply the hand brake and remove the propeller shaft flange nut and washer. Release hand brake and install puller, Tool C-452 (if necessary). Remove the propeller shaft flange and brake drum assembly. Remove the transmission brake support grease shield spring (small one). Remove brake support grease shield from extension.

CAUTION

If screw driver or sharp instrument is used in performing this operation, care must be exercised not to damage the neoprene sealing surface at bottom of shield.

Install puller, Tool C-748 and remove the transmission output shaft rear bearing oil seal.

b. Installation

Using driver, Tool C-3205, install output shaft rear bearing oil seal (metal portion of seal facing in) until driver bottoms on extension, (Fig. 97). Install brake support grease shield on extension housing.

CAUTION

Indent on grease shield must match groove in extension for correct positioning. Also, shield must be located on extension far enough to permit installation of spring.

Install brake support grease shield spring (opening in spring toward adjusting sleeve). Make sure spring is properly seated in groove. Install propeller shaft flange and drum assembly. Install propeller shaft flange washer (convex side towards nut) and nut. Apply hand brake and tighten propeller shaft flange nut to 175 foot-pounds torque. Connect front universal joint and tighten nuts to 37 foot-pounds torque.

Refill transmission (if necessary) with Automatic Transmission Fluid (Type A) to proper level.

42. EXTENSION

a. Removal

Raise vehicle off floor. Drain approximately two quarts of fluid from transmission, then reconnect filler tube at connector. Disconnect front universal joint and secure propeller shaft out of the way. Apply hand brake and remove propeller shaft nut and washer.

Release hand brake and using puller, Tool C-452 (if necessary), remove the propeller shaft flange and drum assembly.

Remove brake adjusting screw cover plate and loosen cable clamp bolt on hand brake support. Disengage the ball end of the cable from operating lever and remove cable from brake support. Disconnect speedometer cable and housing at transmission extension and remove speedometer drive pinion and sleeve assembly. Remove two nuts and lockwashers that hold engine rear support insulator to crossmember, leaving insulator attached to extension. Remove the two top transmission extension to case screws and lockwashers.

Using suitable jack (or engine support fixture Tool C-3487) and extreme care (to prevent damage to oil pan), raise transmission sufficiently for insulator on extension to clear crossmember. Remove four of the remaining extension to case screws and lockwashers and install guide studs, Tool C-3283. Due to interference of the insulator, it will be necessary to remove the bottom extension to case screw with the extension. That is, back screw out as far as possible and slide extension back and continue loosening of screw.

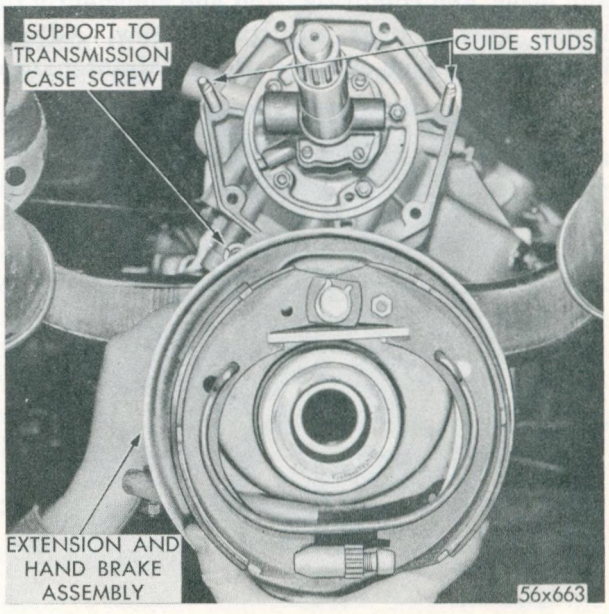


Fig. 55—Removal and Installation of Extension and Handbrake Assembly

CAUTION

Do not remove the one output shaft support to transmission case screw.

Remove extension and hand brake as one assembly, as shown in Figure 55. **If care is used, it is not necessary to remove hand brake support and shoe assemblies from extension to replace output shaft rear bearing.**

b. Installation

With guide studs, Tool C-3283 installed in transmission case, install a new extension gasket over guide studs and into position against output shaft support. Do not use sealing material on gasket. Using extreme care, place extension and hand brake assembly over output shaft and on guide studs. **Due to interference of the insulator, it will be necessary to start the bottom extension to case screw as the extension is pushed into position against support. Do not use hammer or attempt to pull extension in with the aid of screws: otherwise, damage to extension may result. The propeller shaft flange and drum assembly may be used to force bearing in extension on output shaft.**

Remove guide studs, Tool C-3283 and install six remaining extension to case screws and lockwashers. Draw down evenly and tighten 30 foot-pounds torque. After screws have been properly tightened, turn output shaft to make sure it turns freely. Lower transmission and at the same time align mounting studs in insulator with holes in crossmember. Install two nuts and lockwashers that hold the rear engine support insulator and tighten to 35 foot-pounds torque. Engage ball end of hand brake cable in operating lever and tighten cable clamp bolt.

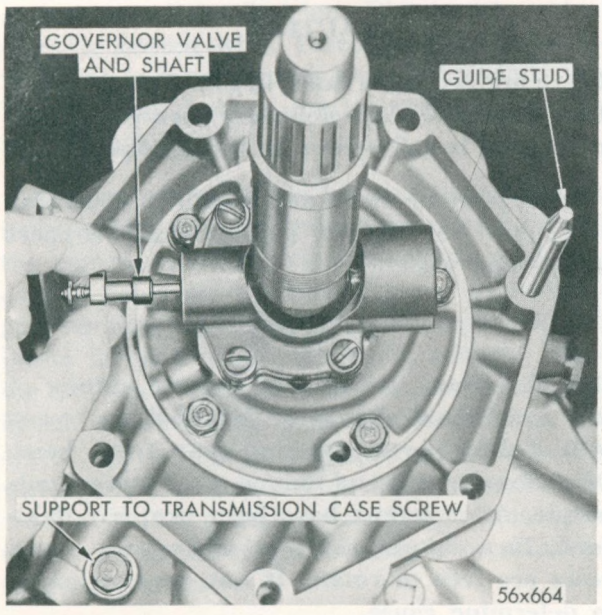


Fig. 56—Removal and Installation of Governor Valve Shaft and Valve

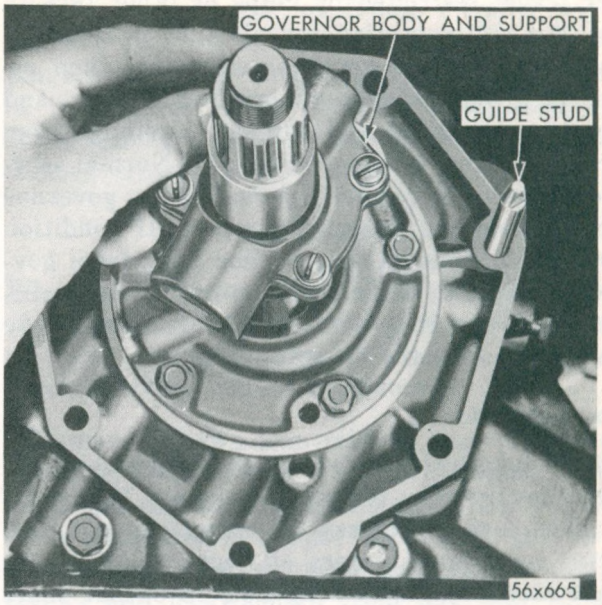


Fig. 57—Removal and Installation of Governor Body and Support Assembly

Install propeller shaft flange and drum assembly, washer, and nut. (If assembly was used to force bearing in extension on output shaft, then omit this operation). Appply hand brake and tighten nut to 175 foot-pounds torque. Install adjusting screw cover plate on hand brake support. Connect front universal joint and tighten to 37 foot-pounds torque. Install speedometer pinion and sleeve assembly. Tighten to 45 foot-pounds torque and connect speedometer cable housing. Lower vehicle and refill transmission to proper level with Automatic Transmission Fluid (Type A).

43. GOVERNOR

a. Removal

Remove extension. Using a screw driver, remove the governor valve shaft snap ring from the weight assembly end. Remove governor valve shaft and valve from governor body assembly (Fig. 56).

Using Tool C-3229, remove governor weight assembly snap ring (large one) and remove governor weight assembly from governor body.

The primary cause of governor operating failures is due to improper operation of governor valve which may be sticking in housing

or travel restricted by chips or other foreign matter. If inspection reveals that it is necessary for further governor servicing, then remove governor support locating screws, and remove governor and support assembly from rear oil pump housing (Fig. 57). Normal servicing does not require removal of the governor body from the governor support. If condition warrants removal of governor body from governor support, when reassembling do not tighten governor body screws until governor body support is located on output shaft.

b. Installation

Slide governor body and support assembly into position in rear oil pump housing. Using extreme care, compress governor support seal ring as support enters oil pump housing. **Do not force.** Align locating hole in output shaft to locating hole in governor support, and install screw and tighten to 7 foot-pounds torque. Holes can be aligned by turning output shaft and holding governor body. If governor body has been removed and reinstalled, tighten four governor body screws to 8 foot-pounds torque. Place governor weight assembly (secondary weight snap ring facing out) into governor body; and using Tool C-3229, install snap ring. Make sure snap ring seats properly. With governor body through output shaft and governor weight assembly, at the same time, position valve into body.

Install the governor valve shaft snap ring. Make sure it is locked securely to shaft. Replace snap ring if distorted. After snap ring installation apply sufficient pressure to both ends of the valve shaft to force snap rings to outer portion of snap ring grooves. (Fig. 129.) Check operation of governor weight assembly and valve by turning output shaft. Both should fall freely in body. Install transmission extension.

44. REAR OIL PUMP

a. Removal

Remove transmission extension. Refer to "Governor—Removal," Paragraph 43. **Using a screw driver, remove the governor valve shaft snap ring from weight assembly end.** Remove governor valve shaft and valve from governor valve body assembly. Using Tool C-3229, remove governor weight assembly snap ring (large one) and remove governor weight assembly from governor body. Remove governor locating screw from governor support. Remove the five rear oil pump housing to output shaft support screws and washers, and install guide studs, Tool C-3288. Remove pump housing, gear, and governor assembly from output shaft. Use dye and mark pump gears in relation to pump housing face. **Do not use scribe. Oil pump pinion is keyed to output shaft pinion by small ball. Use care when removing pinion so as not to lose ball.** Remove governor assembly from oil pump housing.

NOTE: If output shaft is turned to a position where governor locating screw hole is up, when removing rear pump pinion, pump drive ball will also be up preventing ball from falling out.

b. Installation

Slide governor support and body assembly into position in rear oil pump housing. **Compress governor support seal rings as support enters oil pump housing. Do not force.**

Place rear oil pump pinion ball in ball pocket in output shaft. Place rear oil pump pinion (as marked when removed) over output shaft and into position aligning key way in pinion with ball in shaft.

With rear oil pump gear properly positioned in pump housing (check marking), slide rear oil pump and governor assemblies over output shaft and guide studs into position against support.

CAUTION

There are two extra holes in housing which are used for vents. Make definitely sure you do not attempt to install screws in these holes.

Remove guide studs and install the five rear oil pump housing to output shaft support screws and washers.

CAUTION

Dished washers are used to prevent cutting of soft metals and should be installed on screws with dished portion facing away from head. Draw down evenly and tighten to 12 foot-pounds torque. After screws have been properly tightened, turn output shaft to make sure pump gears are free to rotate. If not, remove pump to determine cause.

Align locating hole in output shaft to locat-

ing screw hole in governor support; install locating screw, and tighten to 7 foot-pounds torque. **Holes can be easily aligned by turning output shaft and holding governor body.**

Check operation of governor weight assembly and valve by turning output shaft. Both should fall freely in body. Install transmission extension.

45. REMOVAL AND INSTALLATION OF TRANSMISSION

a. Removal

(1) Disconnect battery. Place push button control in 1 (low) position and raise vehicle off floor.

NOTE: It is necessary for control to be in this position to remove cable from adapter housing on transmission.

Drain transmission and torque converter. When fluid has drained, replace torque converterter drain plug and tighten. Loosen filler tube support bracket screw if necessary. Disconnect the front universal joint and secure propeller shaft out of the way. Remove brake adjusting screw cover plate and loosen cable clasp bolt on hand brake support. Disengage the ball end of the cable from the operating lever and remove cable from brake support. Disconnect speedometer cable and housing at transmission extension. Disconnect neutral starting switch wire. Disconnect throttle control linkage from throttle lever in transmission. Loosen push button control cable adjustable mounting bracket.

Remove control cable adapter housing plug, insert screw driver through hole, and release the control cable spring lock. While releasing control cable spring lock, remove cable from adapter housing. Using the same screw driver, insert through cable opening in adapter housing and push lever rearward to last detent. Reinstall housing plug and tighten. Remove radiator oil cooling lines from transmission (if water cooled). Remove two nuts and lockwashers that hold the engine rear support insulator to the crossmember, leaving insulator attached to transmission.

Remove starter. Install engine support fixture, Tool C-3487; insert hooks of fixture firmly into holes in side of frame member with support ends up against the underside of oil pan flange. Adjust fixture to support the weight of the engine. Raise engine slightly, remove crossmember to torsion bar bracket bolts and remove crossmember.

CAUTION

When using fixture Tool C-3487, do not lower engine more than three inches from floor pan to avoid disrupting the set position of water hose and other engine attachments.

Remove the two transmission case to torque converter housing screws and lockwashers from right side and install guide studs, Tool C-3276. With transmission supported, remove the two transmission case to torque converter housing screws and lockwashers from left side. Slide transmission straight back to avoid damage to front oil pump driving sleeve, then lower to floor.

b. Installation

Install guide studs, Tool C-3276 in the two transmission mounting holes in right side of torque converter housing. With front oil pump drive sleeve lubricated, install, making sure driving lugs are properly engaged with oil pump pinion. **Main portion of drive sleeve will be flush with front of pump housing when properly installed (Fig. 123).**

Note position of driving lugs inside torque converter hub, then position front oil pump drive sleeve on transmission accordingly, to aid in proper engagement when transmission is installed. Slide transmission over guide studs and into position against converter housing. Make sure driving lugs on front oil pump drive sleeve properly engage the torque converter. **To avoid damage to front oil pump, do not attempt to use transmission to torque converter housing screws to bring transmission and housing together. If oil pump drive sleeve and input shaft have been properly aligned, the transmission should slide into position relatively easy. Do not force.**

Install the two transmission case to torque converter housing screws and lockwashers in left side, do not tighten. Remove guide studs and install the two transmission case to housing screws and lockwashers in right side, then

draw the four down evenly and tighten to 50 foot-pounds torque.

Place crossmember into position and install the crossmember to torsion bar bracket bolts. Tighten 55 foot-pounds torque. Lower engine and at the same time align mounting studs in insulator with holes in crossmember.

Install two nuts and lockwashers that hold engine rear support insulator to crossmember and tighten to 35 foot-pounds torque. Remove support fixture, Tool C-3487 from side of frame member. Install radiator oil cooling lines (if water cooled). Connect neutral starting switch wire to switch. Install oil pan filler tube and tighten filler tube nut to 40 foot-pounds torque. Tighten support bracket screw. Connect speedometer cable in housing extension. Engage ball end of hand brake cable in operating lever and tighten cable clamp bolt. Install adjusting brake screw cover plate on hand brake support. Connect front universal joint and tighten nuts to 37 foot-pounds torque.

Connect throttle control linkage to throttle lever on transmission. Install push button control cable in adapter making sure spring lock engages cable. Adjust manual control cable. Refer to "Maintenance Adjustments and Tests," Paragraph 24. Tighten cable adjustable mounting bracket nut securely. Install starter. Lower vehicle and connect battery. Refill transmission with Automatic Transmission Fluid (Type A). Adjust throttle linkage.

RECONDITIONING OF TRANSMISSION

46. REMOVAL OF COMPONENTS

The following precautions should be observed during disassembly of transmission. Cleanliness through the entire disassembly and assembly cannot be over-emphasized. Unit should be thoroughly cleaned when removed from vehicle, preferably by steam. When disassembling, each part should be placed in a suitable solvent, washed, then dried by compressed air. **Do not wipe parts with shop towels.** All of the mating surfaces in the transmission are accurately machined; therefore, careful handling of parts must be exercised to avoid nicks or burrs.

The use of crocus cloth is permissible where necessary, providing it is used carefully. When used on valves, use extreme care so not to round off the sharp edges. The sharp edge portion is vitally important to this type valve. Sharp edges prevent dirt and foreign matter from getting between the valve and body, thus reducing the possibilities of sticking. When it becomes necessary to recondition the transmission, and vehicle has accumulated considerable mileage, install new seal rings on parts requiring their usage.

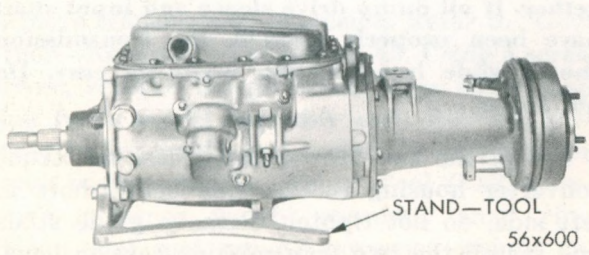


Fig. 58—Transmission Assembly Inverted in Stand

47. OIL PAN—REMOVAL

Place transmission assembly in stand, Tool C-3280, and invert, as shown in Figure 58. Remove the oil pan bolts and remove the oil pan

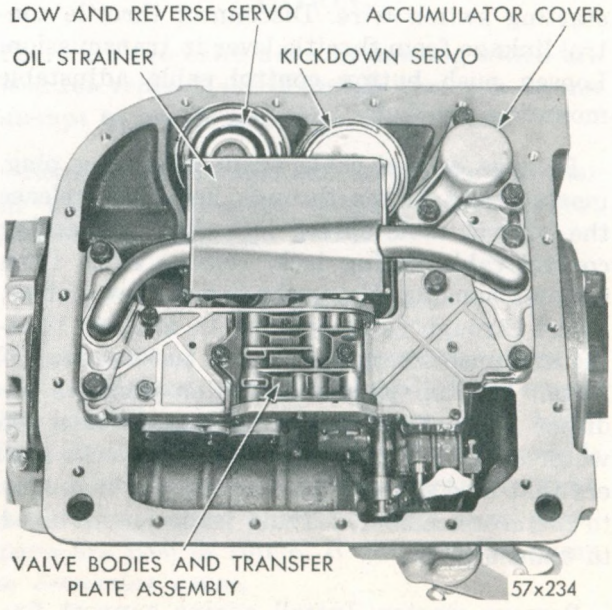


Fig. 59—Transmission Assembly—Oil Pan Removed

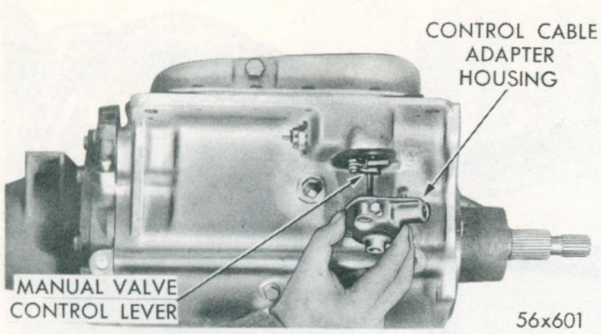


Fig. 60—Removal and Installation of Control Cable Adapter Housing

and gasket, as shown in Figure 59. Note the construction of oil pan bolts, washers used are part of the bolt.

48. VALVE BODIES AND TRANSFER PLATE—REMOVAL

Remove throttle control lever, flat washer, and felt washer from transmission. Remove the three gearshift control cable adapter housing bolts and washers. Remove housing and gasket from transmission, as shown in Figure 60. **Manual valve control lever must be moved to the reverse position before housing can be removed.** Loosen manual valve control lever bolt. Using caution to prevent loss of cable adapter pin, slide lever and cable adapter off shaft.

Remove four oil strainer assembly bolts and lock washers. Remove oil strainer assembly, as shown in Figure 61. One strainer is used for both front and rear oil pumps. Loosen (to relieve spring load) the three accumulator cover bolts with washers, and remove cover and spring from transfer plate, as shown in Figure 62. Remove three transfer plate bolts and

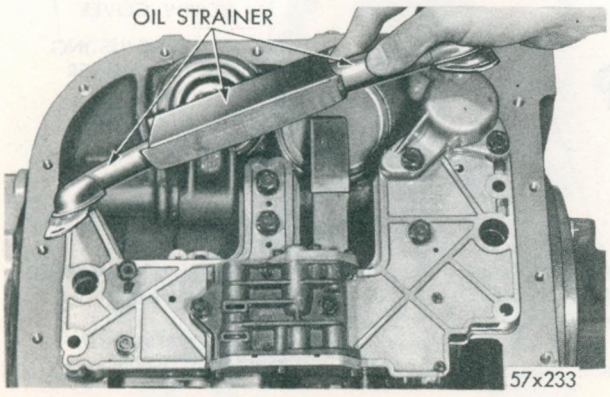


Fig. 61—Removing Oil Strainer Assembly

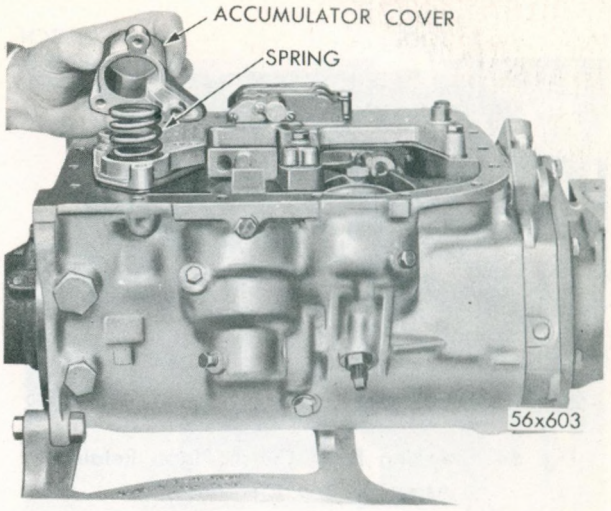


Fig. 62—Removal and Installation of Accumulator Cover

washers. Remove valve bodies and transfer plate assembly from transmission case, as shown in Figure 63. **Mating surfaces are machined: use extreme care so as not to damage these surfaces. Place valve body in stand, Tool C-3528.** Remove the neutral starting switch with cupped washer and "O" ring located in left side of transmission case as shown in Figure 40.

49. CHECKING FRONT CLUTCH END CLEARANCE

Prior to removal of propeller shaft flange and drum assembly, check end clearance of front clutch piston retainer assembly using dial indicator, Tool C-3339, as shown in Figure 64.

To make this check, pry front clutch forward by carefully inserting screw driver be-

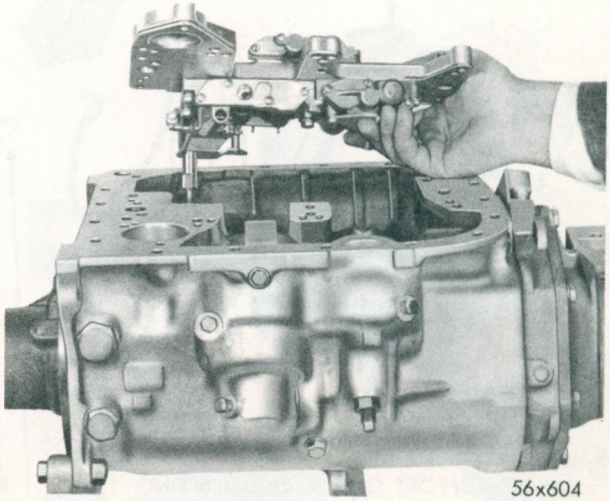


Fig. 63—Removal and Installation of Valve Bodies and Transfer Plate Assembly (Typical View)

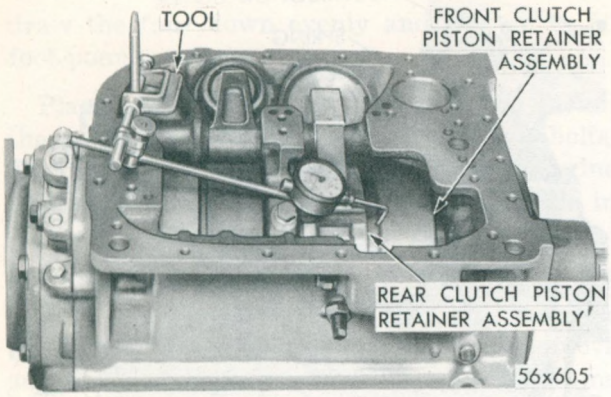


Fig. 64—Checking Front Clutch Piston Retainer Assembly End Clearance

tween the front and rear clutch. Remove screw driver, and with dial indicator point contacting edge of front clutch retainer, set dial indicator to zero. Pry front clutch assembly rearward against rear clutch, remove screw driver, and take indicator reading. This clearance should be from .020 to .050 inch. If this clearance exceeds the specified limits, particular attention should be paid to the condition of the input shaft thrust washer when disassembling transmission.

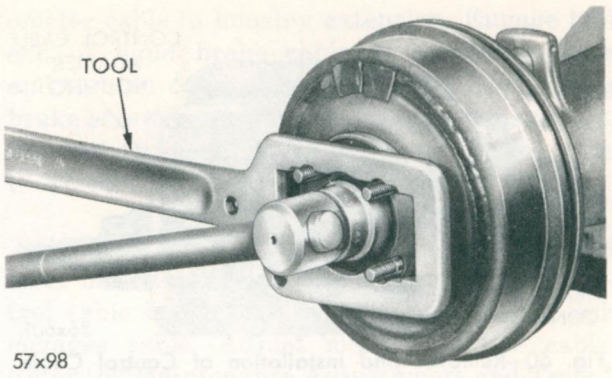


Fig. 65—Removing Handbrake Drum and Flange (Assembly Nut)

50. HAND BRAKE ASSEMBLY—REMOVAL

Remove the transmission flange nut and washer. Use wrench, Tool C-3281, to hold brake drum and flange assembly. (Fig. 65). Attach puller, Tool C-452 (if necessary) and remove propeller shaft flange and drum assembly. Inspect oil seal surfaces. Inspect lining contact surfaces on brake drum assembly for scoring and inspect brake lining for wear.

Remove transmission brake support grease shield spring. This spring has two purposes,

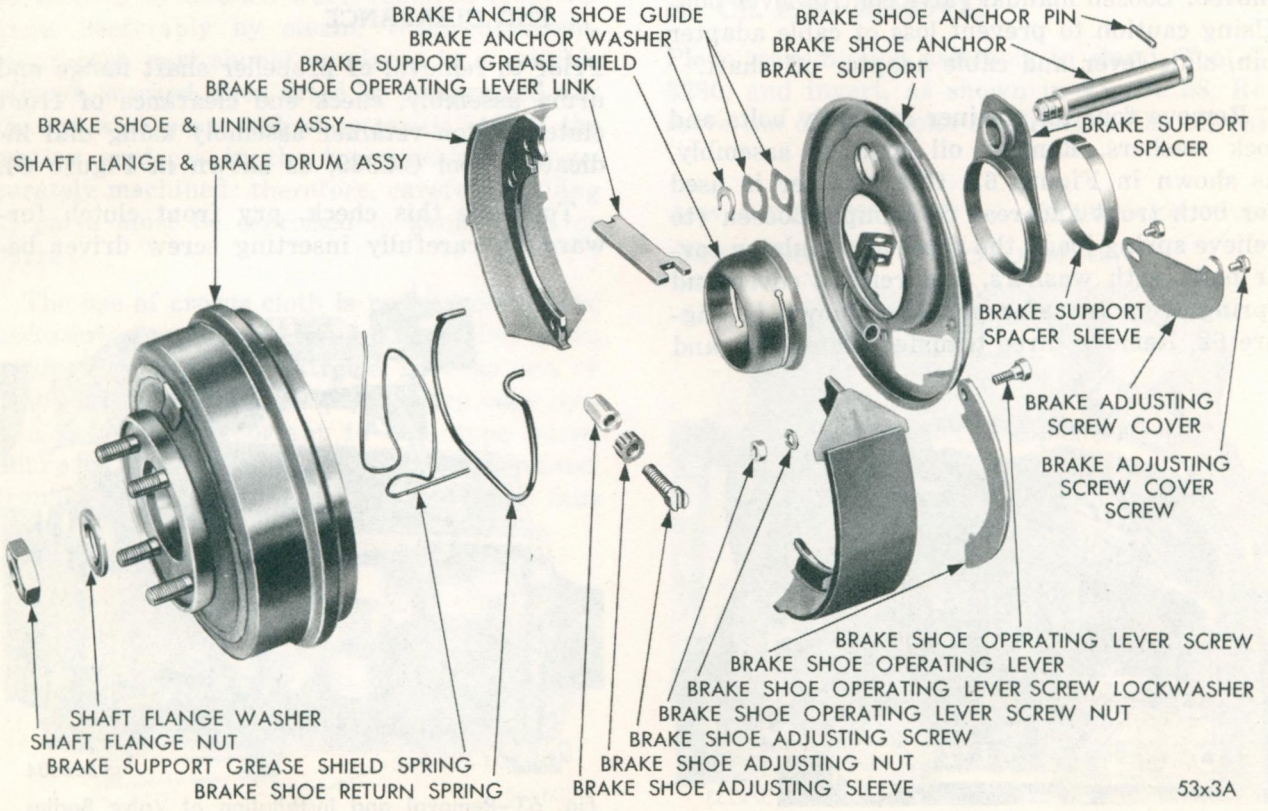


Fig. 66—Internal Expanding Hand Brake (Disassembled View)

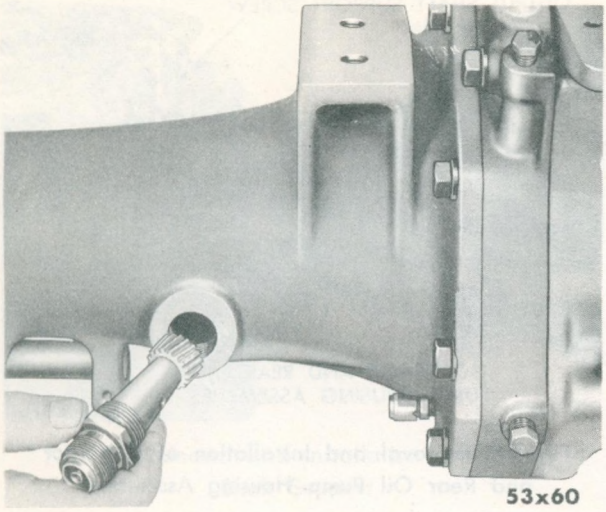


Fig. 67—Removal and Installation of Speedometer Drive Pinion Assembly

it acts as a guide for the brake shoes and retains the brake support grease shield for the brake support grease shield to the transmission extension. (Fig. 66). Remove the brake support grease shield from extension. **If a screw driver or sharp instrument is used in removing this shield, care must be exercised not to damage the neoprene sealing surface at bottom of shield. Note the indent on grease shield for correct positioning on extension.**

Using a suitable drift, remove pin which secures brake shoe anchor in extension housing. Slide balance of handbrake assembly intact from extension housing. Inspect spacer (neoprene) on back of support plate for deterioration and note the steel sleeve used between neoprene spacer and extension.

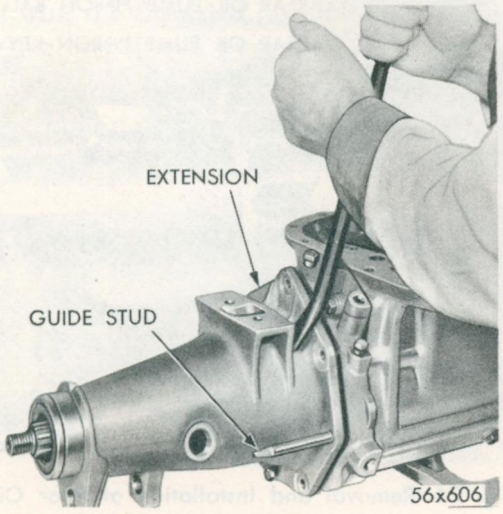


Fig. 68—Removal of Extension

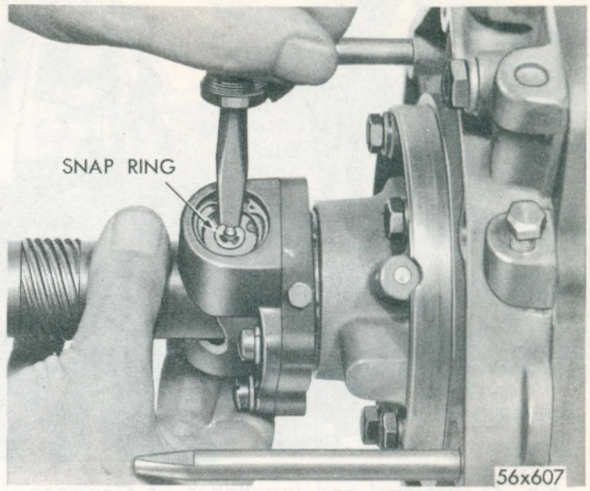


Fig. 69—Removal and Installation of Governor Valve Shaft Snap Ring

51. TRANSMISSION EXTENSION—REMOVAL

Remove speedometer drive pinion and sleeve assembly, as shown in Figure 67. **Nylon gear can be easily damaged if extension is removed without first removing the speedometer drive pinion and sleeve assembly.** Inspect the output shaft rear bearing oil seal and remove (if necessary) using puller, Tool C-748. Remove the seven transmission extension to case bolts and lockwashers. Install guide studs, Tool C-3283 and remove extension from output shaft support assembly by tapping housing lightly with a soft hammer. **Housing may be separated from support by using a pry bar against support screw, as shown in Figure 68.** Remove extension gasket.

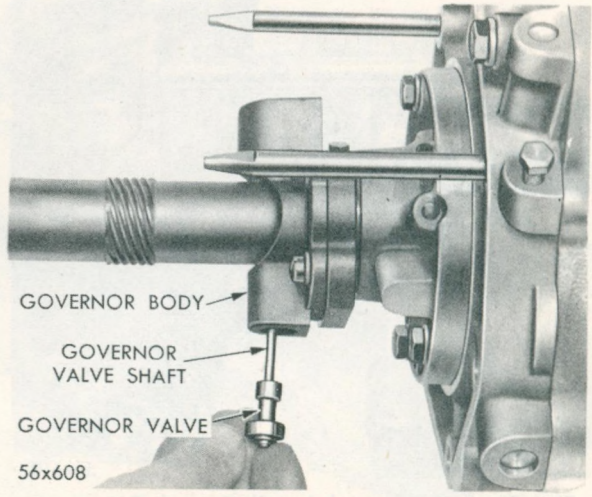


Fig. 70—Removal and Installation of Governor Valve and Shaft

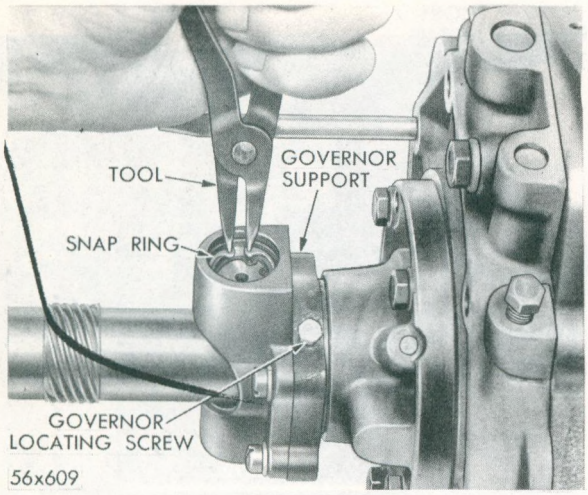


Fig. 71—Removal and Installation of Governor Weight Assembly

52. GOVERNOR AND REAR OIL PUMP HOUSING—REMOVAL

Using a small screw driver, remove the governor valve shaft snap ring from the weight assembly end as shown in Figure 69.

Remove governor valve shaft and valve from governor valve body assembly, as shown in Figure 70. Using pliers, Tool C-3229, remove governor weight assembly snap ring (large), as shown in Figure 71, and remove governor weight assembly from governor body (Fig. 72).

Using a $\frac{5}{16}$ inch socket Tool C-3279 remove governor locating screw from the governor support. Remove the five rear oil pump housing to output shaft support bolts and washers. Remove pump housing, gear, and governor assembly from output shaft, as shown in Figure

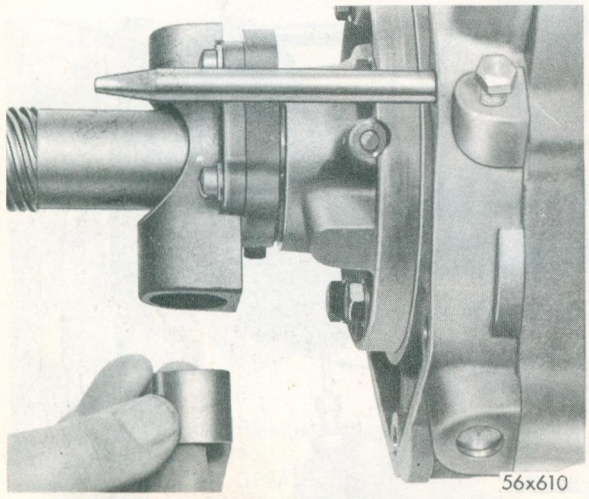


Fig. 72—Removal and Installation of Governor Weight Assembly

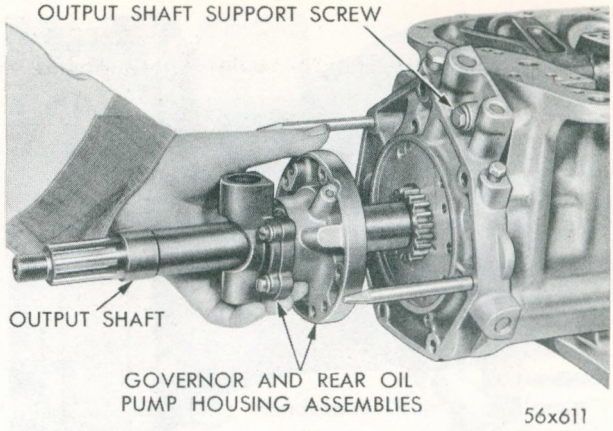


Fig. 73—Removal and Installation of Governor and Rear Oil Pump Housing Assemblies

73. Use dye and mark face of pump gear in relation to pump housing.

Do not use scribe. Oil pump pinion is keyed to output shaft by a small ball. Use care when removing pinion so as not to lose ball. Remove rear oil pump pinion from output shaft, as shown in Figure 74. Mark in the same manner as previously described.

53. OUTPUT SHAFT SUPPORT—REMOVAL

Remove output shaft support to transmission case screw and washer. Slide the output shaft rear support assembly and gasket from transmission case, as shown in Figure 75. If rear support is stuck to transmission case, it can be loosened by tapping lightly with a soft hammer. Remove guide studs, Tool C-3283 from transmission case.

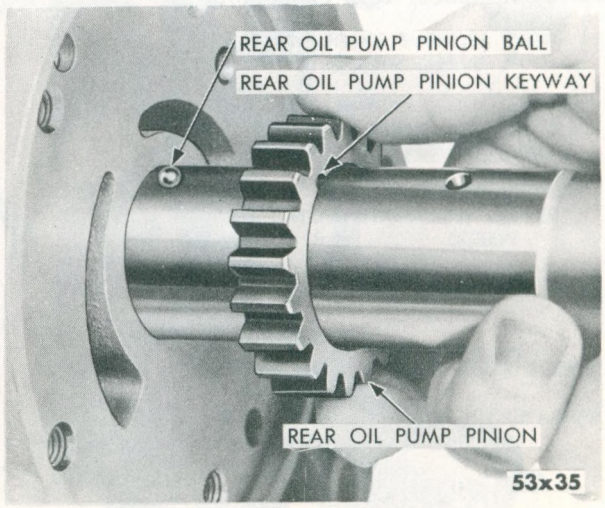


Fig. 74—Removal and Installation of Rear Oil Pump Pinion

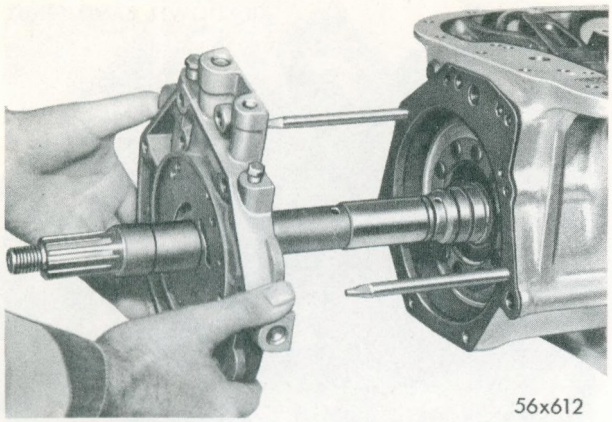


Fig. 75—Removal and Installation of Output Shaft Support

54. REMOVING POWER TRAIN UNIT NO. 1 (OUTPUT SHAFT, KICKDOWN PLANET PINION CARRIER, AND INTERMEDIATE SHAFT ASSEMBLIES)

Remove by sliding unit out rear of transmission case. (Fig. 76). **Support unit as much as possible, when removing, to prevent damage to seal rings on intermediate shaft.**

55. REMOVING POWER TRAIN UNIT NO. 2 (SUN GEAR, REVERSE PLANET PINION CARRIER, OVERRUNNING CLUTCH, AND REAR CLUTCH ASSEMBLIES)

Loosen lock nuts on low-reverse and kickdown band adjusting screws, and back adjusting screws out 2 to 3 turns. Remove the three intermediate support locating bolts and lockwashers (two outside of case and one inside). (Fig. 77). **When removing unit, identify locating hole in the intermediate support to correspond with the threaded locating hole inside of case—for installation purposes. (Fig. 127).**

Keep unit centered as much as possible to prevent binding of intermediate support, and remove assembly from transmission case, as

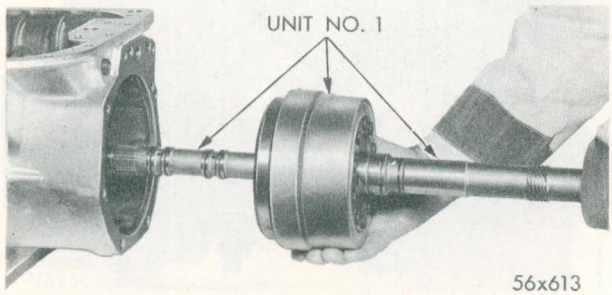


Fig. 76—Removal and Installation of Unit No. 1

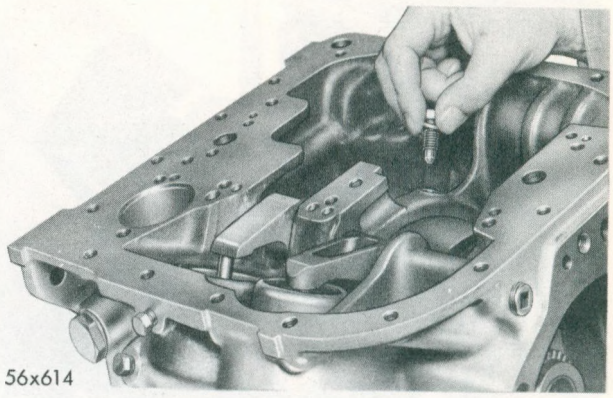


Fig. 77—Removal and Installation of Intermediate Support Locating Screw

shown in Figure 78. **Make sure front clutch and sun gear thrust washer remains in position in front of unit.**

56. REMOVING UNIT NO. 3 (FRONT CLUTCH PISTON RETAINER AND INPUT SHAFT ASSEMBLIES)

Keep unit centered as much as possible, and remove from transmission case, as shown in Figure 79. **Use extreme care when removing to prevent damage to seal rings on input shaft and sealing surfaces in reaction shaft (aluminum).**

57. LOW-REVERSE BAND ASSEMBLY—REMOVAL

Mark the low-reverse band assembly for installation purposes; then compress ends of band sufficiently to remove the low-reverse band

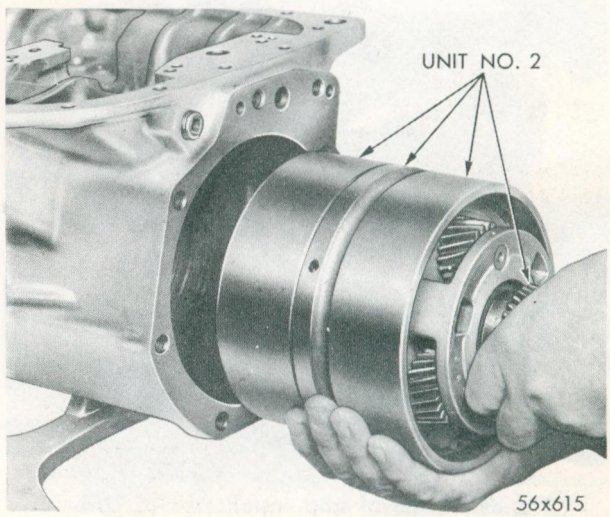


Fig. 78—Removal of Unit No. 2

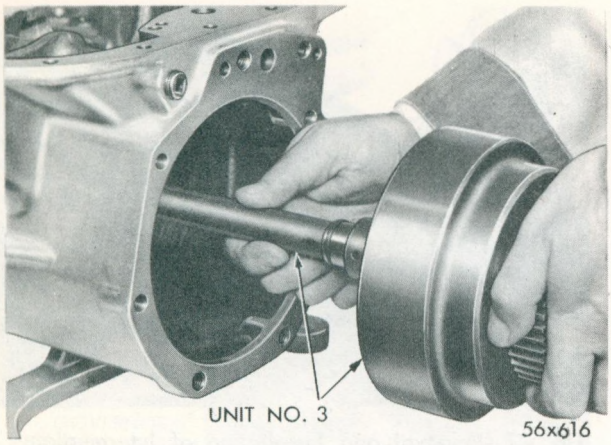


Fig. 79—Removal and Installation of Unit No. 3

strut. Remove low-reverse band assembly by rotating band ends through rear opening in transmission case, as shown in Figure 80. Remove low-reverse band anchor from adjusting screw.

58. KICKDOWN BAND—REMOVAL

Compress kickdown band ends sufficiently to remove the kickdown band strut. (Fig. 81.) (Note that strut is grooved to act as a guide). Remove the kickdown band anchor from adjusting screw. Remove kickdown band assembly by rotating band ends over center support in transmission case, as shown in Figure 82. **Use extreme care when removing band so not to damage lining against edges of transmission case.** Both bands have bonded lining and no attempt should be made to reline them. The kickdown band is **wider** and has **different** lining material.

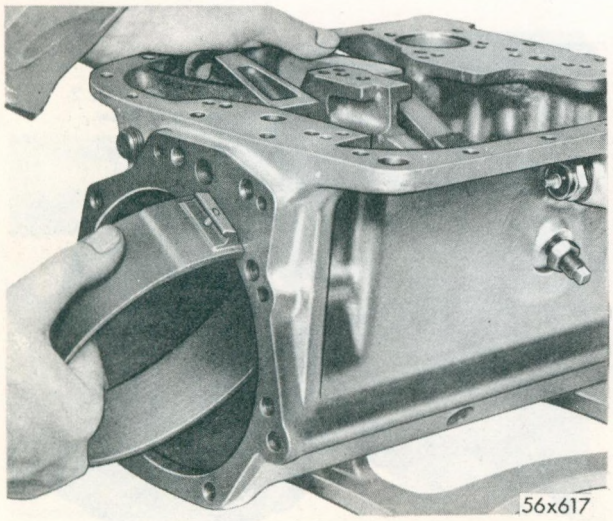


Fig. 80—Removal and Installation of Low-Reverse Band

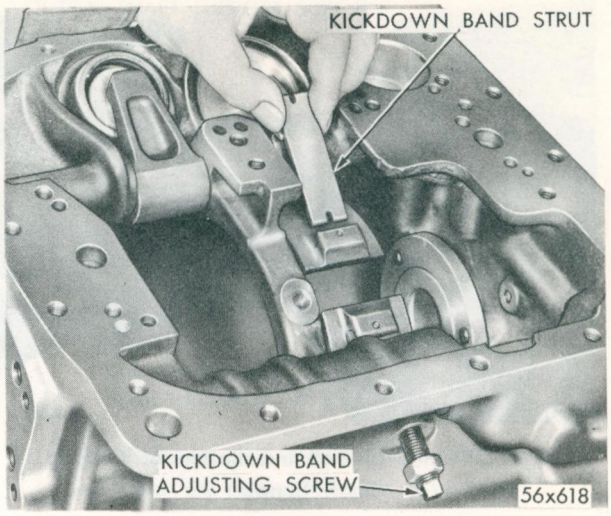


Fig. 81—Removal and Installation of Kickdown Band Strut

59. LOW-REVERSE AND KICKDOWN BAND LEVER ASSEMBLIES—REMOVAL

Remove kickdown and reverse lever shaft stop plug at rear of transmission case. Using pliers, remove kickdown and low-reverse shaft lever spacer (flat). Thread a guide stud, Tool C-3288, into shaft, and remove shaft from case, as shown in Figure 83. Remove kickdown and low-reverse servo levers.

60. LOW-REVERSE SERVO—REMOVAL

Install Tool C-3529 or C-3289 (modified, as shown in Figure 84) on transmission case and compress piston spring retainer. **Due to modification of tool, only one attaching bolt can be used.** Using a screw driver, remove the low-reverse servo piston spring retainer, snap ring, as shown in Figure 85. Loosen compression por-

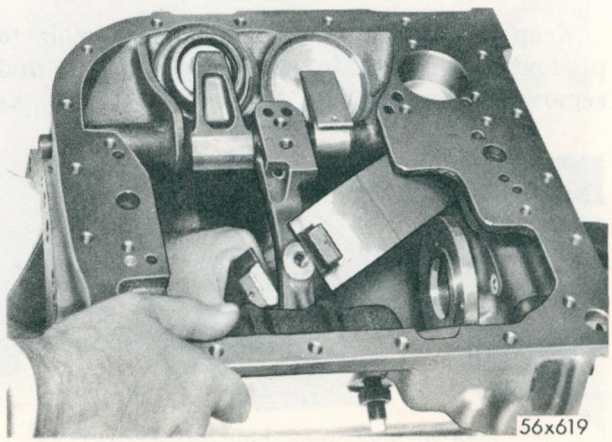


Fig. 82—Removal and Installation of Kickdown Band

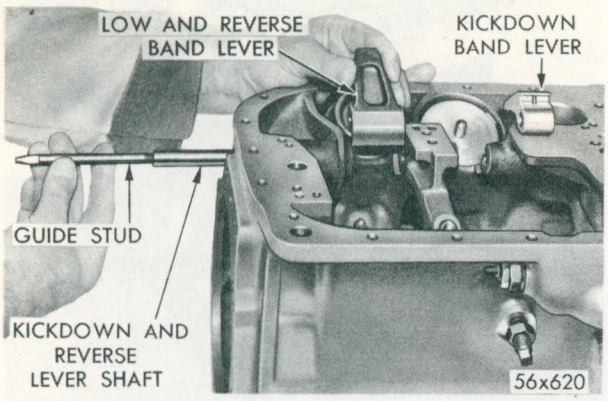


Fig. 83—Removal and Installation of Kickdown and Reverse

tion of tool, and remove. **Spring retainer may require guiding out of transmission case.** Remove the spring retainer, spring and servo piston assembly.

61. KICKDOWN SERVO—REMOVAL

Reinstall Tool C-3529 or C-3289 (modified, as shown in Figure 84), apply sufficient pressure on the kickdown piston rod guide, and remove the snap ring, as shown in Figure 86. Loosen compressing portion of tool, and remove from transmission case. Remove piston rod guide, piston spring, and piston rod. Using pliers, Tool C-484, remove the kickdown piston from the transmission case. Using pliers, Tool C-484, remove the accumulator piston from transmission case, as shown in Figure 87.

62. FRONT OIL PUMP—REMOVAL

Remove front oil pump drive sleeve (if installed). Remove the transmission regulator valve spring retainer, gasket, cup, spring,

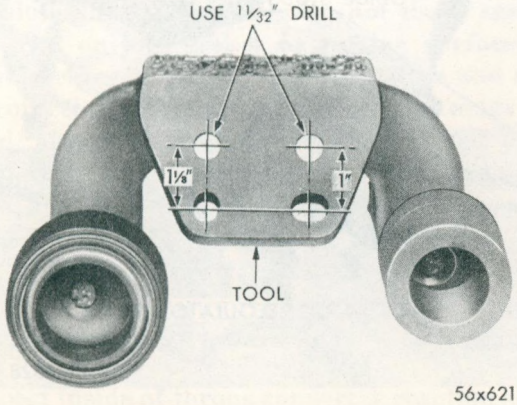


Fig. 84—Modification of Tool C-3289

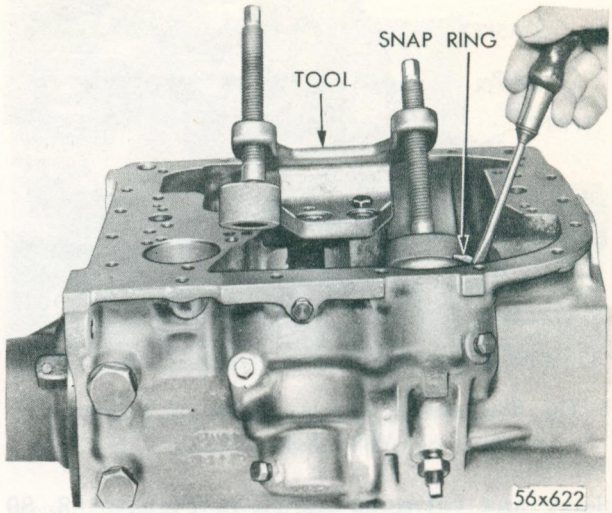


Fig. 85—Removal and Installation of Low-Reverse Servo

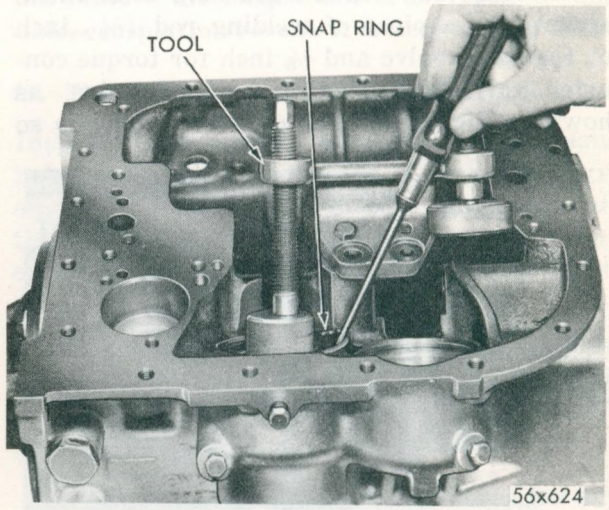


Fig. 86—Removal and Installation of Kickdown Piston Rod

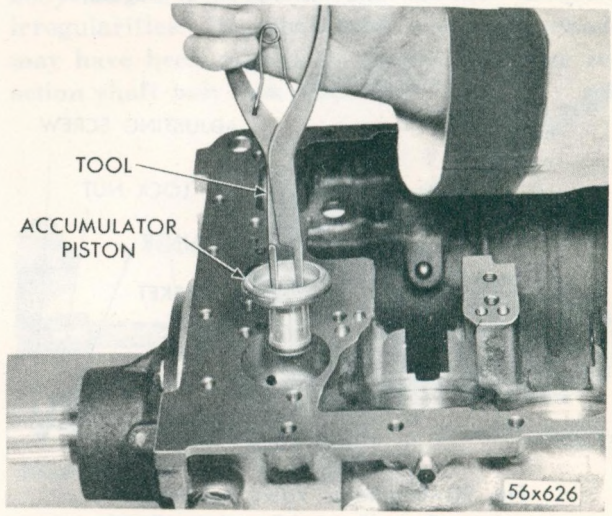


Fig. 87—Removal and Installation of Accumulator Piston

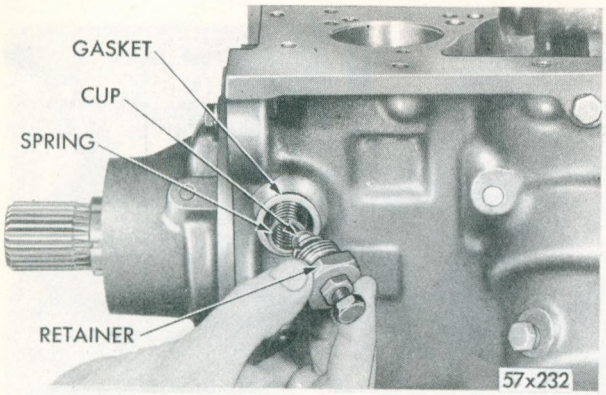


Fig. 88—Removal and Installation of Regulator Valve Retainer

sleeve and valve, as shown in Figures 88, 89 and 90. Remove the torque converter valve retainer, gasket, spring, and valve. These valves can be removed with the aid of a mechanical retriever or a piece of welding rod ($\frac{5}{32}$ inch for regulator valve and $\frac{1}{8}$ inch for torque converter valve) inserted in end of valve, as shown in Figure 49. The converter valve is so

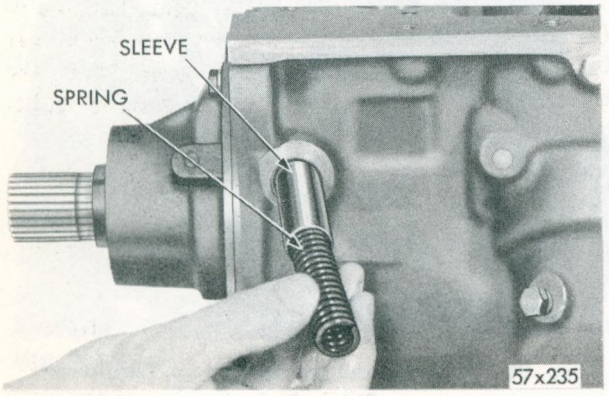


Fig. 89—Removal and Installation of Regulator Valve Spring

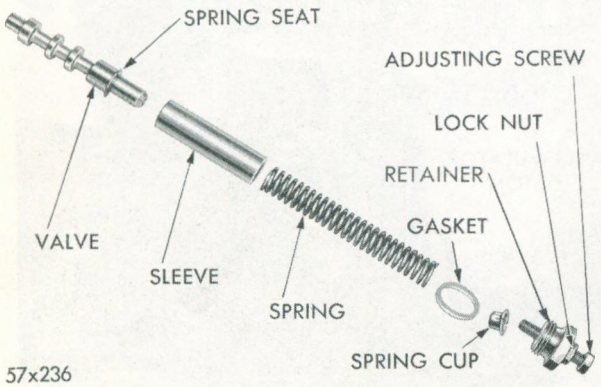


Fig. 90—Regulator Valve Assembly (Disassembled View)

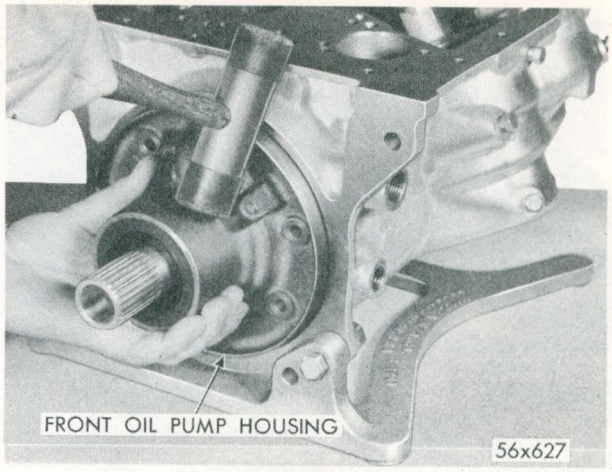


Fig. 91—Removal of Front Oil Pump Housing Assembly

constructed that it will not drop into front housing during removal.

Remove the seven front oil pump housing to transmission case bolts and washers. Sealing washers used under bolts are made from aluminum; discard if damaged. Remove oil pump housing assembly from transmission case by tapping housing lightly with a soft hammer, as shown in Figure 91. **Using dye, mark pump gears in relation to face of oil pump housing for reassembly purposes. Do not scribe.**

63. REGULATOR VALVE BODY—REMOVAL

Install guide studs, Tool C-3288; and using the two threaded holes provided in the regulator valve body, install guide studs, Tool C-3283, as shown in Figure 92. Pull regulator valve body off of torque converter reaction shaft and remove gasket. **Regulator valve body (Fig. 93)**

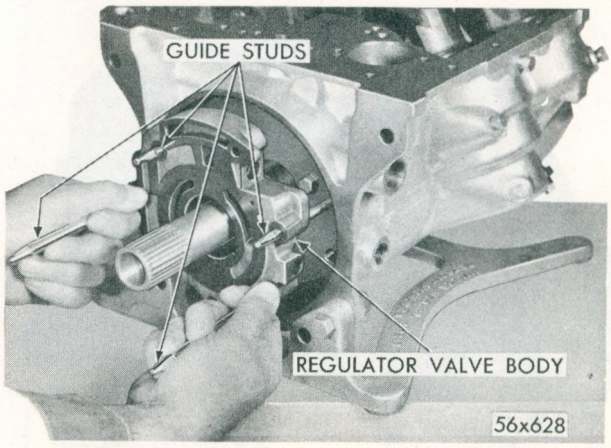


Fig. 92—Removing Regulator Valve Body

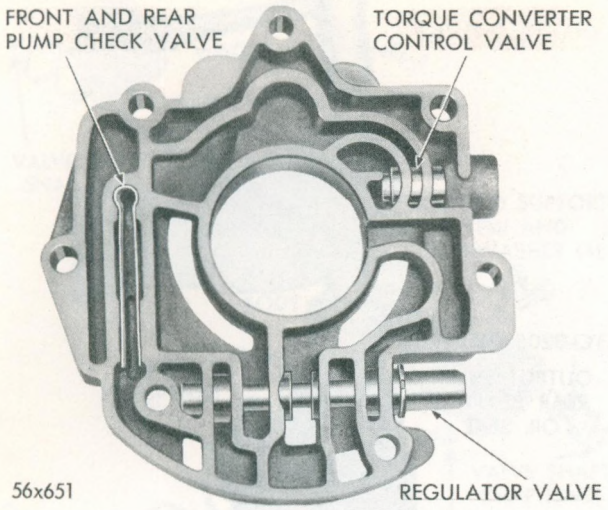


Fig. 93—Regulator Valve Body and Valves

is made of aluminum and requires care in handling to avoid damage.

64. TORQUE CONVERTER REACTION SHAFT —REMOVAL

Refer to "Inspection of Torque Converter Reaction Shaft," Paragraph 66. If inspection reveals it is necessary to remove torque converter reaction shaft, proceed as follows. Remove torque converter reaction shaft seal ring (neoprene). Remove three transmission case to reaction shaft bolts and washers. Using Tool C-3531, press reaction shaft out of transmission case, as shown in Figure 94.

65. DISASSEMBLY, INSPECTION AND ASSEMBLY OF COMPONENT PARTS

The following precautions should be observed during assembly of component parts. Where lubrication is required, use Automatic Transmission Fluid (Type A). **Do not use a sealing material on any gasket or mating surface, always use new gaskets.** Torque all bolts and nuts to correct specifications. Where snap rings are used, always make sure they are seated properly. If mating parts do not go together properly, always check reason. **Do not force parts unnecessarily.**

66. TORQUE CONVERTER REACTION SHAFT —INSPECTION

Inspect inside of torque converter reaction shaft for burrs. Inspect splines on shaft for burrs and

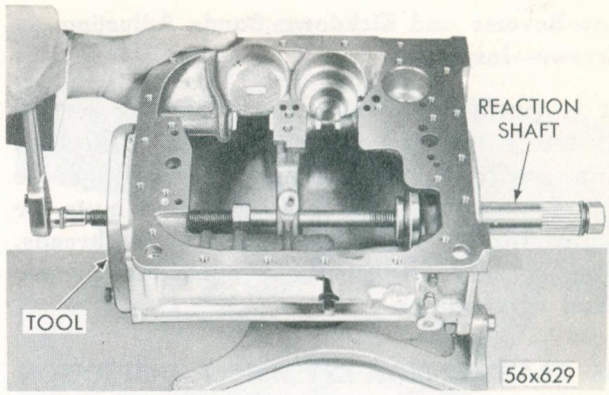


Fig. 94—Removal and Installation of Torque Converter Reaction Shaft

wear. Inspect the reaction shaft seal ring (neoprene) for deterioration and hardness. Inspect thrust surface for wear and slight scores. **Do not remove the torque converter reaction shaft unless inspection reveals it is necessary to do so.**

67. TRANSMISSION CASE—INSPECTION

Inspect transmission case for cracks, sand holes, and stripped threads. Check for burrs on mating surfaces. Blow compressed air through all passages to make sure they are open. Check pressure take-off plugs for tightness.

Using straight edge, Tool C-3335, inspect valve body mating surface on transmission case for any burrs or irregularity in surface. Surfaces should be smooth and flat.

Inspect servo and accumulator bores for any scores or scratches. Light scratches may be removed with crocus cloth. Check regulator valve body mating surface in front of case for any irregularities. **Disregard any scratches which may have been caused by torque converter reaction shaft bolt lock washers.**

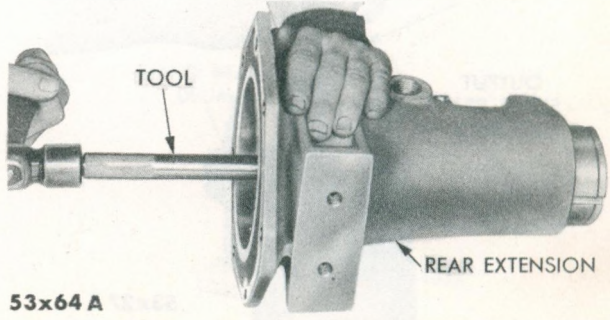


Fig. 95—Removing Output Shaft Rear Bearing

Low-Reverse and Kickdown Bands Adjusting Screws—Inspection

It is vitally important that adjusting screws fit freely into transmission case. **When lock nuts are loose, the adjusting screws must be finger free. If not, inspect screws and nuts for pulled threads or foreign material in threads. This is very important in obtaining proper band adjustments.**

68. TRANSMISSION EXTENSION—INSPECTION

Inspect extension for cracks in casting and remove burrs from gasket surface. Inspect vent (drive type) in top of extension and make sure it is open and free from dirt, undercoating, etc. The purpose of this vent is to prevent vacuum from forming in transmission case when it is drained. Vent also releases fumes and expansion of oil caused by heat. Clean output shaft rear bearing and dry with compressed air. **Do not spin bearing with air pressure.** Inspect bearing for rough spots. Do not remove bearing from extension unless inspection reveals it is necessary to do so.

69. OUTPUT SHAFT REAR BEARING—REMOVAL

If necessary to remove rear bearing, proceed as follows: Remove output shaft rear bearing oil seal—if installed. Using pliers, Tool C-760 and remove the output shaft rear bearing snap ring. Inspect ring for distortion. Using driver, Tool C-3275, drive output shaft rear bearing out of rear extension, as shown in Figure 95.

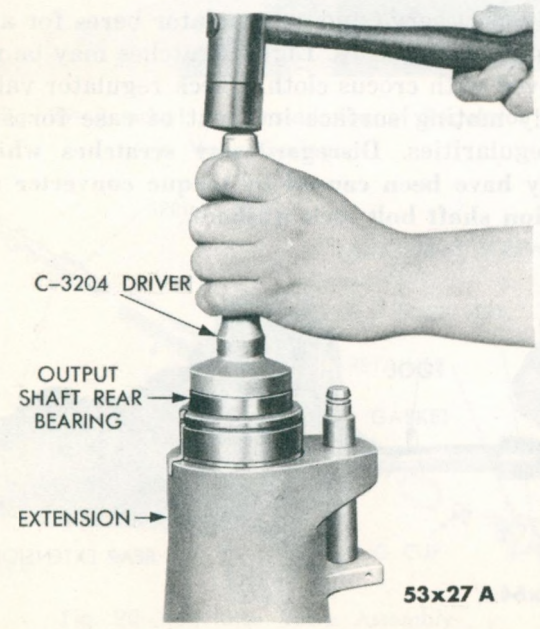


Fig. 96—Installing Output Shaft Rear Bearing

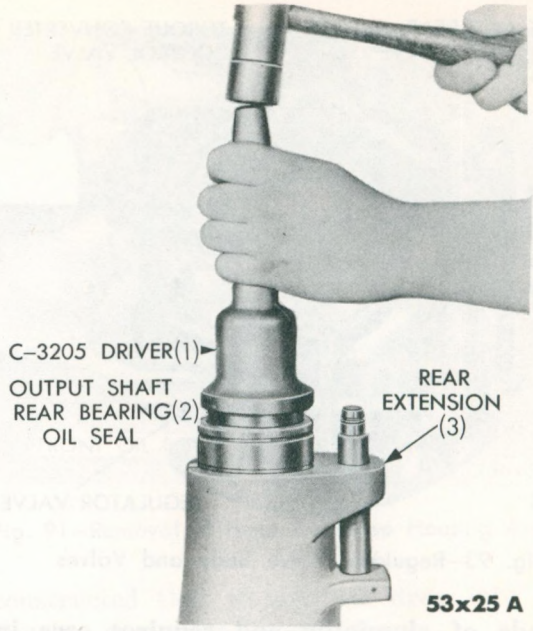


Fig. 97—Installing Output Shaft Rear Bearing Oil Seal

70. OUTPUT SHAFT REAR BEARING AND OIL SEAL—INSTALLATION

Using driver, Tool C-3204, install the output shaft rear bearing in extension, as shown in Figure 96. Make sure bearing is properly seated, lubricate with Automatic Transmission Fluid (Type A). Install output shaft rear bearing snap ring. **Snap rings available in two sizes, select one to give minimum clearance.** Using driver, Tool C-3205, install output shaft rear bearing oil seal (with metal portion of seal facing in) until tool bottoms on extensions, as shown in Figure 97.

71. GOVERNOR DISASSEMBLY AND INSPECTION (Fig. 98)

Using pliers, Tool C-339, remove snap ring from governor weight assembly. **Keep thumb pressure against secondary weight when removing snap ring (spring loaded).** Remove governor secondary weight and spring. Inspect all parts for burrs and wear. Check secondary weight for free movement in primary weight by placing secondary weight in primary weight without the spring. Primary weight should fall freely when both parts are clean and dry. Inspect governor weight spring for distortion.

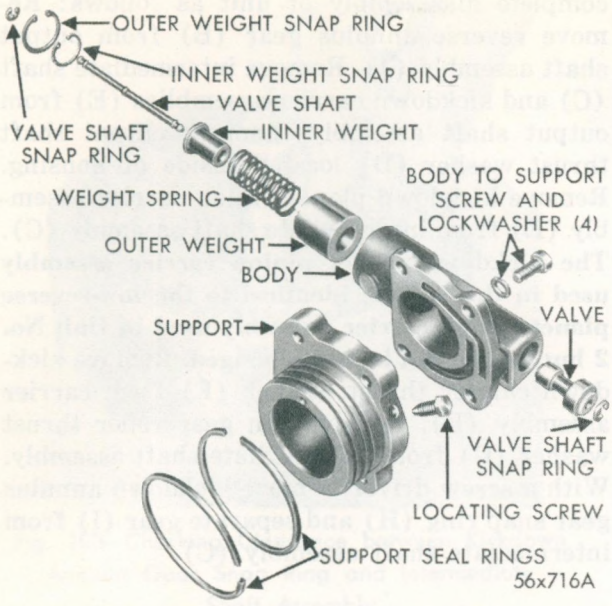


Fig. 98—Governor Assembly (Disassembled View)

Place secondary weight and spring in primary weight, compress spring and install snap ring. Make sure snap ring is seated properly. Slide governor body and support from rear oil pump housing. Remove the two governor support seal rings and inspect. Remove the four governor body to support bolts and lockwashers. Separate body from support. **Washers are part of bolt and serviced as an assembly. Mating surfaces are machined and can be easily damaged. Inspect oil passages and make sure they are free from dirt or foreign matter. Clean passages with compressed air. Inspect governor valve and body for slight scores. Valve should travel freely in governor body.**

72. REAR OIL PUMP—INSPECTION

Inspect oil pump housing machined surfaces for nicks and burrs and housing plug for leaks. Inspect oil pump gears for scoring or pitting. With gears cleaned and installed in pump housing (as marked) and using straight edge, Tool C-3335 (and feeler gauge), check clearance between pump housing face and face of gears, as shown in Figure 99. Clearance limits are from .001" to .0025".

73. GOVERNOR ASSEMBLY—REASSEMBLY

Lubricate the two governor support seal rings with Automatic Transmission Fluid (Type A) and install on the governor support. Make sure

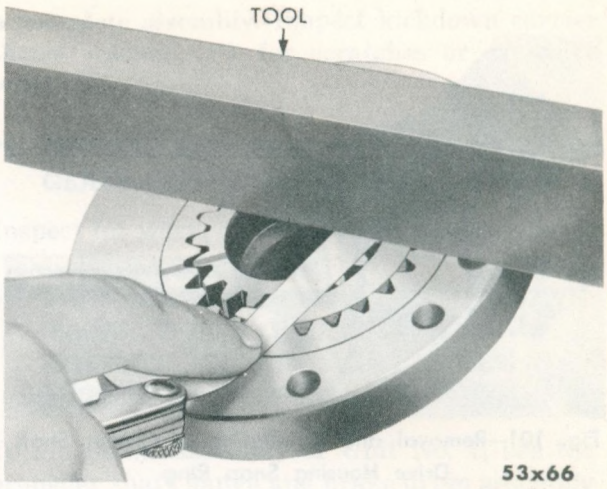


Fig. 99—Checking Clearance between Rear Pump Body and Gears

they are free to rotate in grooves. Position governor body on support and install the four bolts with attached lockwashers. **Do not tighten bolts at this time.** Slide governor support and body assembly into position in rear oil pump housing. **Compress governor support seal rings with fingers as support enters oil pump housing. Do not force.**

74. OUTPUT SHAFT SUPPORT—INSPECTION

Inspect all oil passages in output shaft support for any obstructions. Remove pressure take-off plugs (governor and rear clutch apply Fig. 40) and clean passage with compressed air. Check

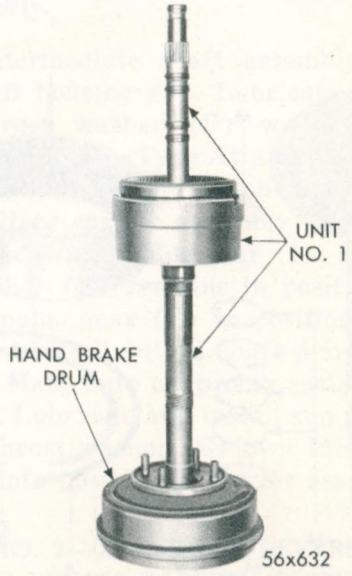


Fig. 100—Using Propeller Shaft Flange and Brake Drum Assembly (As a Holding Fixture for Unit No. 1)

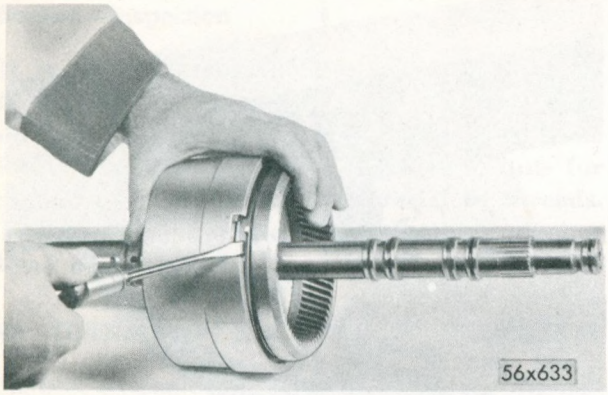


Fig. 101—Removal and Installation of Output Shaft Drive Housing Snap Ring

rear oil pump mating surface for burrs and score marks. Check for stripped threads in support. Inspect gasket surfaces for burrs and dirt. Inspect inside bearing surface for wear and scoring.

75. DISASSEMBLY, INSPECTION AND ASSEMBLY OF POWER TRAIN UNITS

Unit No. 1 (Output Shaft, Kickdown Planet Pinion Carrier, and Intermediate Shaft Assemblies) —Disassembly.

Unit can be placed in the propeller flange and brake drum assembly to aid in disassembly, as shown in Figure 100. Using a screw driver, remove output shaft drive housing snap ring, as shown in Figure 101. Refer to Fig. 102 and complete disassembly of unit as follows: Remove reverse annulus gear (B) from output shaft assembly (J). Remove intermediate shaft (C) and kickdown carrier assemblies (E) from output shaft assembly. Remove output shaft thrust washer (D) located inside of housing. Remove kickdown planet pinion carrier assembly (E) from intermediate shaft assembly (C). **The kickdown planet pinion carrier assembly used in this unit is identical to the low-reverse planet pinion carrier assembly used in Unit No. 2 but should not be interchanged.** Remove kickdown carrier thrust washer (F) from carrier assembly (E). Remove sun gear roller thrust washer (G) from intermediate shaft assembly. With a screw driver, remove kickdown annulus gear snap ring (H) and separate gear (I) from intermediate shaft assembly (C).

76. OUTPUT SHAFT—INSPECTION

Inspect speedometer drive gear for any nicks or burrs. Any nick or burr on gear surface can be removed with the use of a sharp edged stone. Inspect thrust surfaces, journals, and inner bushing for scores or excessive wear. Inspect riveting and housing for any cracks and internal driving lugs for excessive wear. Housing and output shaft is serviced as an assembly.

Inspect interlocking seal rings (K—L) on output shaft (J) for wear or broken locks, and make sure they turn freely in the grooves. **Do**

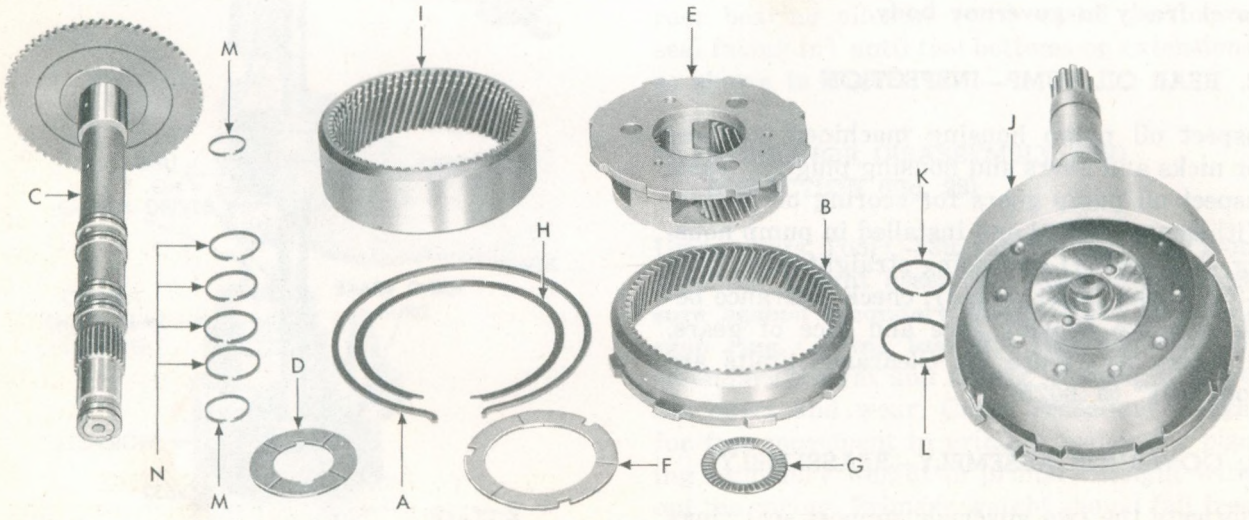


Fig. 102—Unit No. 1 (Disassembled View)

Fig. 103—Checking Clearance between Kickdown Annulus Gear Snap Ring and Intermediate Shaft Assembly

not remove rings unless condition warrants. When replacing rings, use extreme care so as not to damage interlocking portion of ring. Make sure all oil passages are open by blowing out with compressed air. Inspect output shaft (D) and kickdown carrier (F) thrust washers for scratches or excessive wear. Inspect sun gear (roller type) thrust washer (G) for pitted or cracked rollers.

77. INTERMEDIATE SHAFT ASSEMBLY—INSPECTION

Inspect all bearing and thrust surfaces for scoring or scratches. Blow compressed air through all oil passages; make sure they are open and free of foreign matter. Inspect the four large (N) and two small (M) interlocking seal rings for excessive wear, broken ends, and make sure they rotate freely in the grooves. Intermediate shaft and clutch feed tubes are serviced as an assembly.

78. KICKDOWN PLANET PINION CARRIER ASSEMBLY—INSPECTION

Inspect planet pinion carrier for cracks and pinion for broken or worn gear teeth. Using a feeler gauge, check end clearance on individual planet pinion gears, clearance should be .006" to .017". Inspect pinion shafts for fit in the carrier and make sure pinions are free to rotate on shafts. Make sure shaft lock pins are installed. **Do not replace carrier assembly unless inspection reveals it is necessary. The planet pinion carrier and pinions are serviced only as a complete assembly.** Inspect kickdown carrier thrust washer (F) for scratches or excessive wear.

79. REVERSE AND KICKDOWN ANNULUS GEARS—INSPECTION

Inspect for worn, cracked, or broken gear teeth.

80. UNIT NO. 1 (OUTPUT SHAFT, KICKDOWN PLANET PINION CARRIER AND INTERMEDIATE SHAFT ASSEMBLIES) —ASSEMBLY.

To aid in the assembly of Unit No. 1, use the propeller shaft flange and brake drum assembly which was removed from the transmission. With output shaft assembly (J) in the upright position, lubricate output shaft thrust washer (D) with Automatic Transmission Fluid (Type A) and place into position in housing. Place kickdown annulus gear (I) in position on intermediate shaft assembly (C) and install snap ring (H) (select fit). Using a feeler gauge, check the clearance under the kickdown annulus gear snap ring (Fig. 103). Clearance limits are as close to zero as possible. Snap rings are available in the following two thickness:

PT #1636357	.060" to .062"
1636358	.064" to .066"

When checking clearance, support annulus gear on edge of bench so intermediate shaft will seat properly in gear. Make sure snap ring seats properly.

Place intermediate shaft assembly (C) in output shaft housing (J). Lubricate kickdown carrier thrust washer (F) with Automatic Transmission Fluid (Type A) and place in position on kickdown planet pinion carrier assembly (E). Place carrier assembly (E) in position in kickdown annulus gear (I). Make sure thrust washer (F) remains in position. Place reverse annulus gear (B) in position in housing (J) and install output shaft drive housing snap ring. Make sure snap ring seats properly in housing. Lubricate and install sun gear (roller type) thrust washer (G) over intermediate shaft and into position in carrier assembly.

81. UNIT NO. 2—(SUN GEAR, REVERSE PLANET PINION CARRIER, OVERRUNNING CLUTCH, AND REAR CLUTCH PISTON RETAINER ASSEMBLIES)—DISASSEMBLY

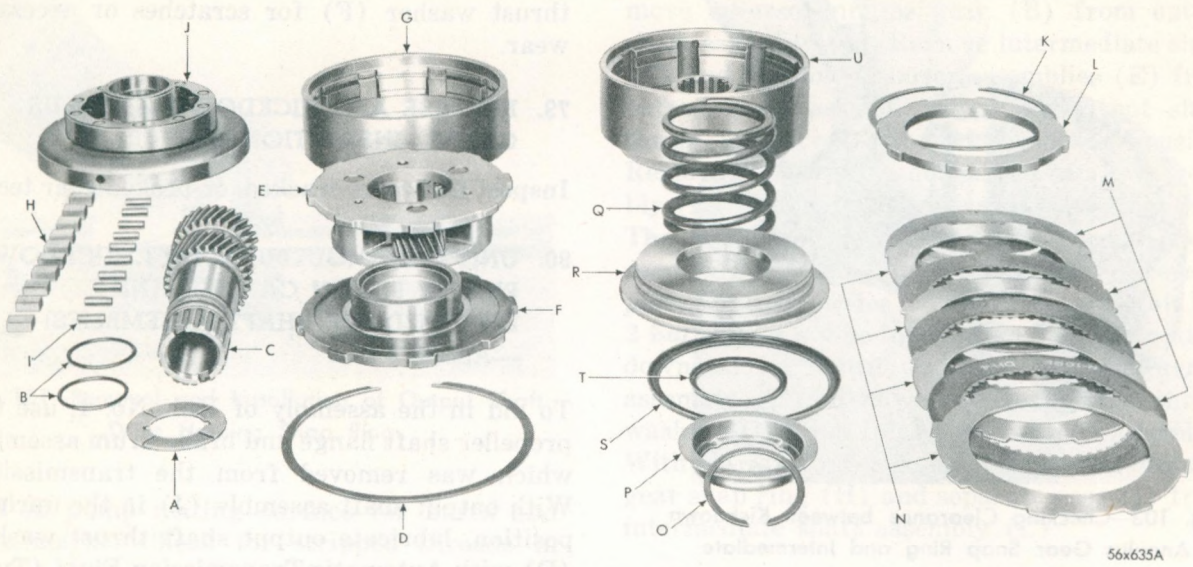


Fig. 104—Unit No. 2 (Disassembled View)

The letters referred to in the Disassembly, Inspection, and Assembly of this unit pertain to Figure 104.

With unit setting in upright position, remove sun gear and front clutch thrust washer (A). Using two screw drivers, inserted between clutch and intermediate support, remove rear clutch retainer assembly from sun gear, as shown in Figure 105. Remove the two rear clutch seal rings (neoprene) from sun gear. Remove reverse sun gear from overrunning clutch and reverse planet pinion carrier asemblies, as shown in Figure 106.

Install fixture, Tool C-3527, in intermediate support and cam assembly, as shown in Figure 107. Remove intermediate support and cam assembly from overrunning clutch hub (Fig. 108). Using a screw driver, remove snap ring (D) from low and reverse band drum assembly (G). Remove the low and reverse planet pinion carrier assembly (E) from reverse band drum. Remove overrunning clutch hub assembly from reverse band drum, as shown in Figure 109.

Remove overrunning clutch cam roller springs (H) and rollers (I) (ten each) by removing fixture, Tool C-3527, from intermediate support and cam assembly. **Have assembly over bench when removing tool.**

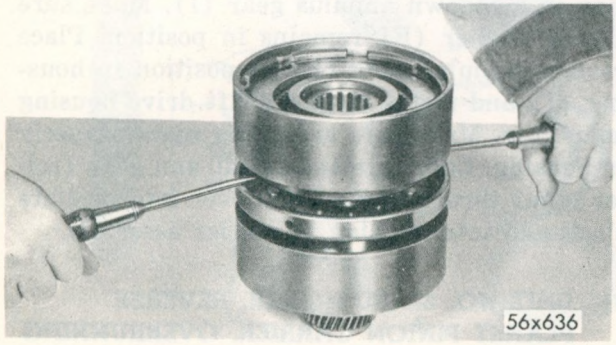


Fig. 105—Removing Rear Clutch Piston Retainer Assembly from Sun Gear

82. REAR CLUTCH PISTON RETAINER ASSEMBLY—DISASSEMBLY

Using screw driver, remove snap ring (large)

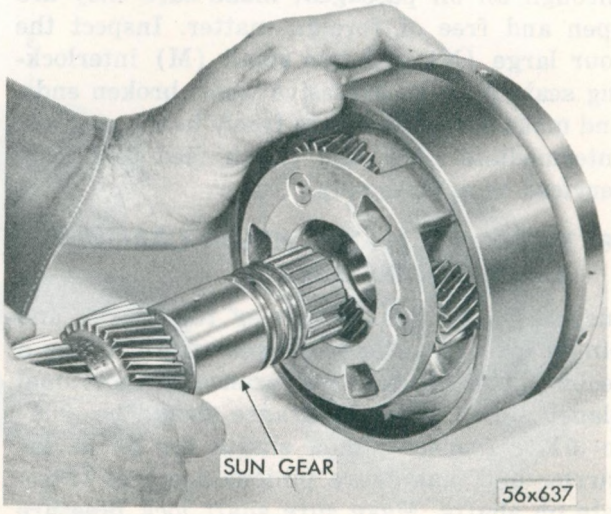


Fig. 106—Removal and Installation of Sun Gear (Reverse Planet Pinion Carrier and Overrunning Clutch Assembly)

Fig. 107—Installation of Tool X-3427 in Intermediate Support and Cam Assembly

from rear clutch piston retainer assembly, as shown in Figure 110. Remove rear clutch pressure plate (L) from retainer assembly. Invert clutch piston retainer assembly and remove the clutch plates (N) and driving disc (M) assemblies (four each). Using compressor, Tool C-3575, slightly compress the rear clutch piston return spring retainer, as shown in Figure 111. **Use extreme care not to damage piston return spring retainer by compressing spring too far.**

Release compressor, Tool C-3575, and remove

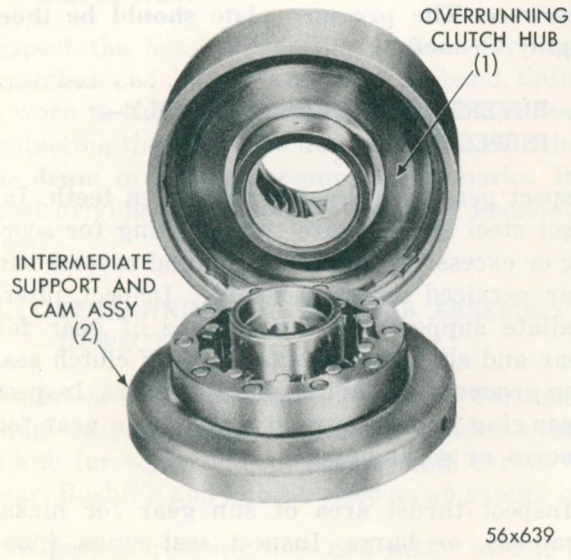


Fig. 108—Removal and Installation of Intermediate Support and Cam Assembly from Overrunning Clutch Hub

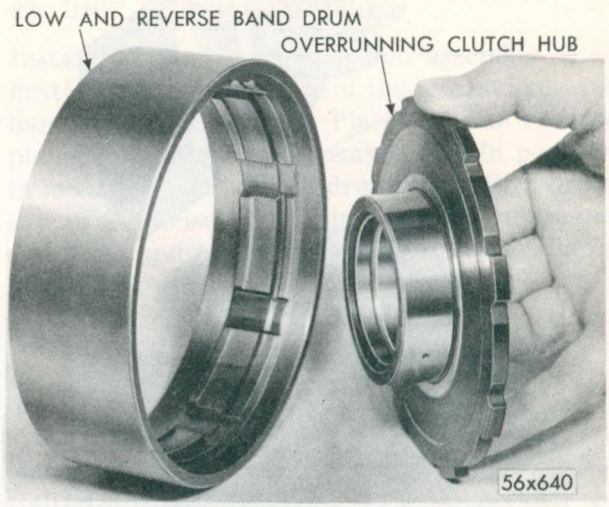


Fig. 109—Removal and Installation of Overrunning Clutch Hub in Low and Reverse Band Drum

the clutch return spring retainer (P) and spring (Q) from clutch piston retainer assembly. Spring retainer may require guiding past snap ring groove as tool is released. Using a twisting motion, remove the clutch piston assembly (R) from retainer. Remove rear clutch piston inner and outer seal rings (S & T).

83. CLUTCH DRIVING DISC AND PLATE—INSPECTION

Inspect driving discs for evidence of burning, glazing and flaking off of facing material. Check discs by scratching facings with finger

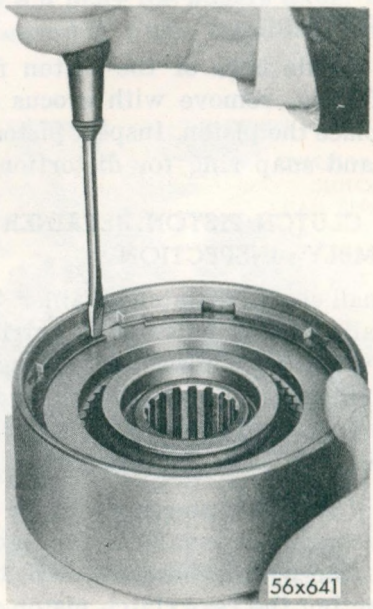


Fig. 110—Removal and Installation of Rear Clutch Piston Retainer Snap Ring

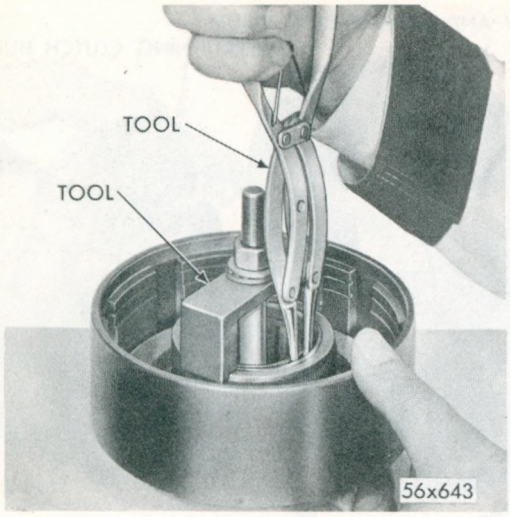


Fig. 111—Removal and Installation of Rear Clutch Spring Retainer Snap Ring

nail; if material collects under nail, replace all of driving discs. Replace driving discs if splines have become damaged. Inspect the steel clutch plates and pressure plate surfaces for evidence of burning, scoring, and damaged driving lugs; replace if necessary.

84. PISTON AND SEAL RINGS—INSPECTION

Inspect seal ring surfaces in piston retainer for nicks or deep scratches. Light scratches will not interfere with sealing of neoprene rings. Inspect inner and outer piston seal rings (neoprene) for deterioration, wear, and hardness. Inspect seal ring groove in piston for nicks or burrs.

Inspect inside bore of the piston for score marks; if light, remove with crocus cloth; if heavy, replace the piston. Inspect piston spring, retainer, and snap ring for distortion.

85. REAR CLUTCH PISTON RETAINER ASSEMBLY—INSPECTION

Note the ball check in clutch retainer. The purpose of ball check is to relieve centrifugal oil pressure when transmission is in neutral or operating in drive (breakaway) and engine speeds are increased; otherwise clutch may engage. Make sure ball operates freely.

Inspect the band contacting surface for deep scores and burns, especially if the band lining is worn to the point where the steel band has been contacting the rear clutch piston retainer. **Do not machine the piston retainer in a lathe to remove score marks.**

Inspect steel clutch plate contacting surfaces for burrs or brinelling. Make sure clutch driving lugs on steel clutch plates travel freely into retainer. Remove any metal pickup on hub of retainer.

86. REAR CLUTCH PISTON RETAINER—ASSEMBLY

Lubricate and install inner piston seal ring (T) on hub of clutch retainer. **Make definitely sure that lip of seal is facing down and seal is properly seated in groove.** Lubricate and install outer seal ring (S) on clutch piston (lip of seal facing away from flange). Place piston assembly (R) in clutch retainer (U) and with a twisting motion, seat piston in bottom of retainer. Install piston return spring on hub and position spring retainer and snap ring on spring.

Using compressor, Tool C-3575, compress the clutch spring sufficiently to seat the snap ring, as shown in Figure 111. **Piston spring retainer may require guiding past the clutch hub. Make sure snap ring is properly seated.** Remove compressor, Tool C-3575. Lubricate all clutch plates and drive discs with Automatic Transmission Fluid (Type A). Assemble by placing one of the rear clutch steel plates, in the clutch retainer followed by a driving disc. Repeat this procedure until all four discs and four plates have been installed. **Do not install rear clutch pressure plate and snap ring at this time as the rear clutch pressure plate will be used as an assembly tool in selecting the proper front clutch clearance. The pressure plate should be thoroughly cleaned.**

87. REVERSE SUN GEAR ASSEMBLY—INSPECTION

Inspect gears for cracked or broken teeth. Inspect steel back bronze type bushing for scoring or excessive wear. Bushing and reverse sun gear serviced as an assembly. Inspect intermediate support bearing surface of gear for wear and slight score. Inspect rear clutch seal ring grooves on gear for nicks or burrs. Inspect inner ring sealing area in bore of sun gear for grooves or scratches.

Inspect thrust area of sun gear for nicks, scratches, or burrs. Inspect seal rings (neoprene) for deterioration, wear nicks, or hardness. Inspect front clutch and sun gear thrust washer for scratches or excessive wear.

88. INTERMEDIATE SUPPORT AND CAM ASSEMBLY—INSPECTION

Inspect riveting of cam to intermediate support. Inspect cam roller surface for brinelling. Inspect roller spring retaining tabs for being bent or distorted. Inspect bearing surface on hub for scoring.

Inspect steel back bronze type bushing in hub for scratches or scoring and excessive wear. Bushing and intermediate support are serviced as an assembly. Inspect overrunning clutch cam rollers for being pitted or scored. Inspect overrunning cam roller springs for distortion. Replace if necessary.

89. LOW AND REVERSE PLANET PINION CARRIER ASSEMBLY—INSPECTION

Inspect planet pinion carrier for cracks and pinions for broken or worn gear teeth. Using a feeler gauge, check end clearance on individual planet pinion gears, clearance should be .006″ to .017″.

Inspect pinion shafts for fit in the carrier and make sure pinions are free to rotate on shafts. Make sure shaft lock pins are installed. **Do not replace carrier assembly unless inspection reveals it is necessary. The planet pinion carrier and pinions are serviced only as a complete assembly.**

90. LOW AND REVERSE BAND DRUM—INSPECTION

Inspect the band contacting surface for deep scratches and burns, especially if band lining is worn to the point where steel band has been contacting the drum. **Do not attempt to machine the drum in lathe to remove score marks.** Inspect driving lugs inside of drum for excessive wear.

91. OVERRUNNING CLUTCH HUB ASSEMBLY —INSPECTION

Inspect cam roller contacting surface for brinelling. Inspect steel back bronze type bushing in hub for scratching or scoring and excessive wear. Bushing and hub serviced as an assembly.

Inspect lubricating hole and make sure it is free from foreign matter by cleaning with compressed air. Inspect reverse band drum snap ring (select fit) for being distorted.

92. UNIT NO. 2—ASSEMBLY

Install overrunning clutch hub assembly (hub first) into snap ring side of the low and reverse band drum, (Fig. 109). Place low and reverse planet pinion carrier assembly (E) in position in low and reverse band drum (G). With drum supported, select snap ring to give minimum clearance and install. Snap rings are available in the following three thicknesses:

PT #1636315	.060″ to .062″
1636316	.064″ to .066″
1636317	.068″ to .070″

Place fixture, Tool C-3527, in position in intermediate support and cam assembly, and install cam springs and rollers, as shown in Figure 112. **Make definitely sure that cam springs and rollers are properly seated against cam; otherwise, damage to springs will result when overrunning clutch hub is installed.** With intermediate support and cam assembly resting on bench, lubricate bushing and install low and reverse band drum assembly over hub. While holding the two assemblies together, remove fixture, Tool C-3527. Lubricate bearing surface on reverse sun gear and install intermediate support and planet pinion carrier assembly.

Lubricate the two sun gear-rear clutch seal rings (neoprene) with Automatic Transmission Fluid (Type A) and install on reverse sun gear. Install rear clutch piston retainer assembly on reverse sun gear. **To prevent personal injury, do not place the fingers under the clutch retainer assembly when installing.** Install the

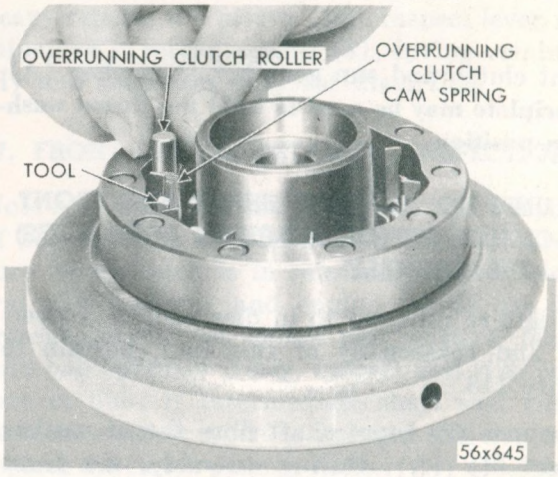


Fig. 112—Installation of Overrunning Clutch Rollers and Springs in Intermediate Support and Cam Assembly

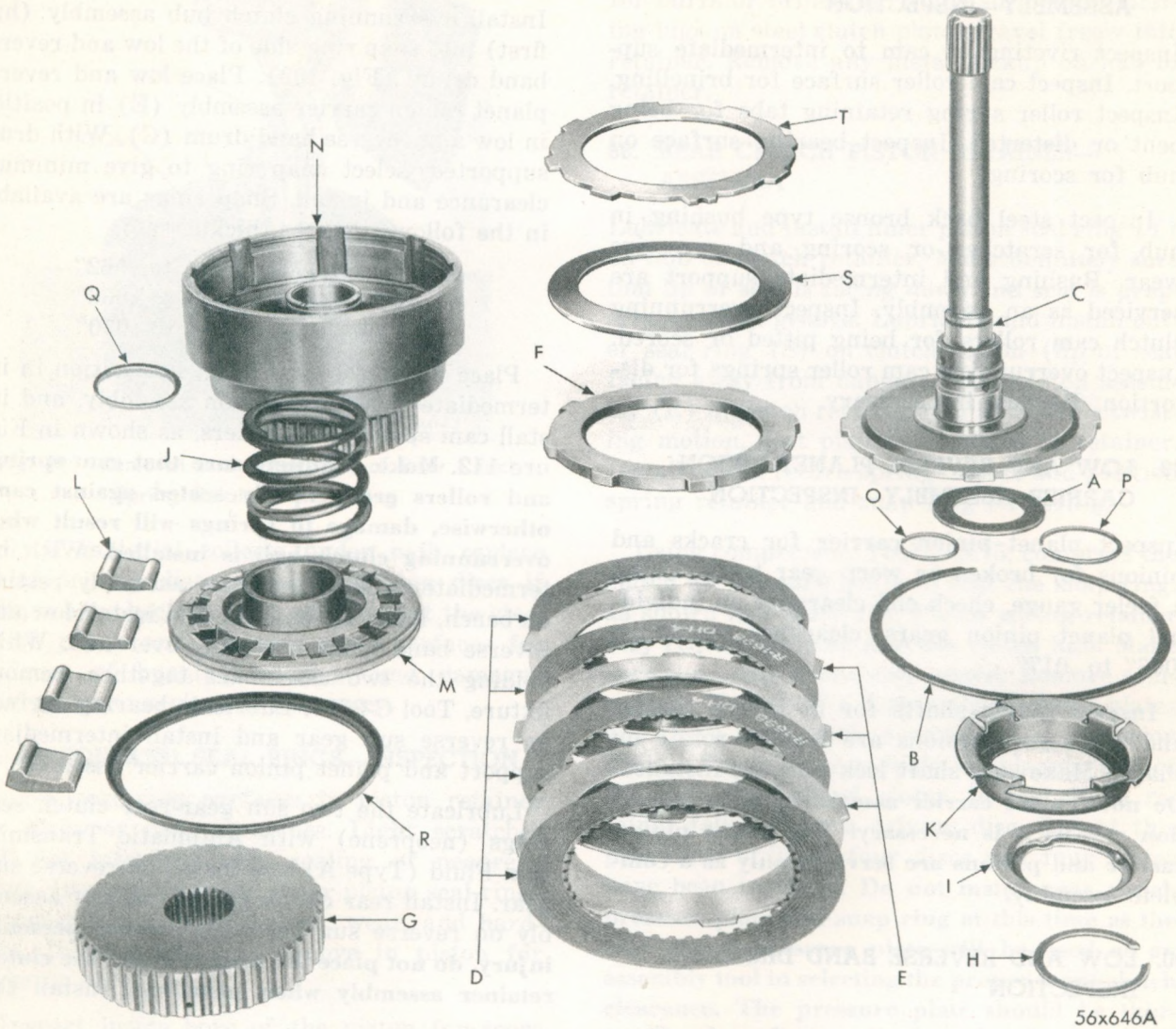


Fig. 113—Unit No. 3 (Disassembled View)

front clutch and sun gear thrust washer (A). **Lubriplate may be used to hold the thrust washer in position.**

93. UNIT NO. 3—(INPUT SHAFT AND FRONT CLUTCH PISTON RETAINER ASSEMBLIES) —DISASSEMBLY

The letters referred to in disassembly, inspection and reassembly of this unit, pertain to Figure 113.

Remove the input shaft fibre thrust washer (select fit) (A). **During assembly, the front clutch cushion spring (S) was preloaded to 500 pounds. To remove snap ring (B) and input shaft, the front clutch assembly must be placed in an arbor press. With the rear of retainer resting on a suitable support, press the input shaft only far enough into retainer to permit removal of the snap ring with a screw driver.**

If an arbor press is not available, two large "C" clamps may be used by placing them 180° apart and applying equal pressure. If "C" clamps are used, make sure they are positioned so as not to damage the ball check located in back side of retainer.

Slowly release pressure on arbor press, then remove the retainer and input shaft from the arbor press. Remove the input shaft assembly (C) from the clutch piston retainer (N). Invert the front clutch piston retainer, and re-

move the cushion spring retaining plate (T), cushion spring (S), driving disc (4) (D), clutch plates, (3), (E), pressure plate (F) and clutch hub (G). Install compressor Tool C-3575, then compress the front clutch piston return spring retainer (I).

Using pliers, Tool C-3301, remove the piston return spring snap ring (H). Release and remove fixture, Tool C-3575. Remove the clutch piston return spring retainer (I) and spring (J). Remove lever retainer (K) and levers (4) (L) from front clutch piston retainer (N). Using a twisting motion, remove the piston assembly from the retainer, as shown in Figure 114.

94. INPUT SHAFT—INSPECTION

Inspect the input shaft thrust washer (A) for cracks or excessive wear. Inspect front clutch snap ring (B) for distortion. Inspect interlocking seal rings (O and P) for wear or broken locks. Make sure they turn freely in the grooves. **Do not remove rings unless condition warrants.** When replacing rings, use extreme care not to damage interlock portion of ring. Make sure all oil passages are open by blowing out with compressed air.

Check splines and lugs for nicks or burrs. Inspect bearing and thrust surfaces for nicks or scratches. Inspect steel back bronze type bushing for scratches or scoring or excessive wear. Bushing and input shaft are serviced as an assembly.

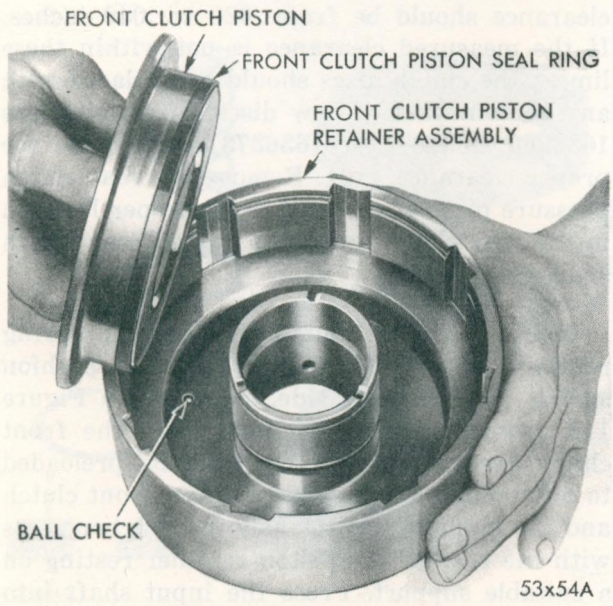


Fig. 114—Removal and Installation of Front Clutch Piston Assembly

95. CLUTCH DRIVING DISCS PLATES, AND HUB—INSPECTION

Inspect driving discs (D) for evidence of burning, glazing, and flaking off of facing material. Check discs by scratching facings with finger nail; if material collects under nail, replace all of driving discs. Replace driving discs if splines have become damaged. Inspect the steel clutch plates (E) cushion spring retaining plate (T), and pressure plate (F) surface for evidence of burning, scoring, and damaged lugs; replace if necessary. Inspect cushion spring (S) for distortion and evidence of scoring.

Inspect lever contacting surface on pressure plate for evidence of wear. Inspect clutch hub (G) driving lugs for wear and remove any metal pickup which may have accumulated on either side of the hub. Inspect splines in center of hub for burrs and wear. (Oil passages in hub are to lubricate clutch plates). Make sure they are free of foreign matter.

96. FRONT CLUTCH PISTON, SEAL, AND LEVERS—INSPECTION

Inspect levers (L) for wear or distortion. Remove and inspect inner and outer piston seal rings (Q and R) (neoprene) for deterioration, wear and hardness. Inspect seal ring groove in piston for nicks or burrs.

Inspect inside portion of piston hub for score marks. If light remove with crocus cloth; if heavy replace the piston (M). Inspect lever retainer (K), return spring (J), spring retainer (I) and snap ring (H) for distortion.

97. FRONT CLUTCH RETAINER—INSPECTION

Note ball check in clutch retainer. The purpose of ball check is to relieve centrifugal oil pressure when clutch is in released position (neutral and reverse) and engine speeds are increased; otherwise, clutch may engage. Make sure ball operates freely. Inspect seal ring surface in hub; if intermediate shaft seal rings have excessively worn or grooved this surface, replace the clutch piston retainer (N) assembly.

Remove any metal pickup on hub of retainer, and inspect seal ring groove for nicks or burrs.

Inspect steel clutch plate contacting surfaces for scores or brinelling. Make sure clutch driving lugs on steel plates travel free in retainer. Inspect splines on rear of retainer for nicks, burrs, or brinelling. Inspect thrust surface on rear of retainer for scratches or scoring. Make sure all clutch feed and lubricating passages are free from foreign matter.

98. UNIT NO. 3—ASSEMBLY

Lubricate and install inner (neoprene) seal ring (Q) on hub of clutch retainer. **Make definitely sure that lip of seal is facing down and seal is properly seated in groove.** Lubricate and install outer seal ring (R) on clutch piston with lip of seal facing away from flange.

Place piston assembly (M) in clutch retainer and with a twisting motion, seat piston in bottom of retainer, as shown in Figure 114. Place lever retainer (K) in piston and install the four levers (L). **Make sure levers are free and properly seated in piston slots.**

Install clutch return spring (J) over hub of clutch retainer (N) and position spring retainer (I) and snap ring (N) on spring. Using compressor, Tool C-3575, compress the clutch return spring sufficiently to seat snap ring with pliers, Tool C-3301. **Spring retainer may require guiding past the piston retainer hub. Make sure snap ring is properly seated.** Remove spring compressing portion of Tool C-3575. Install pressure plate (F) (smooth side up) in retainer. Install discs and plates by placing one of the driving discs (D) in the clutch retainer followed by a steel plate (E). Repeat this procedure until all driving discs and steel plates have been installed.

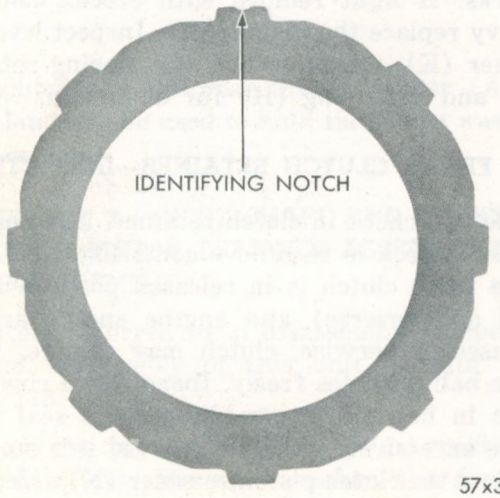


Fig. 115—Identification of Front Clutch Piston Spring Retaining Plate

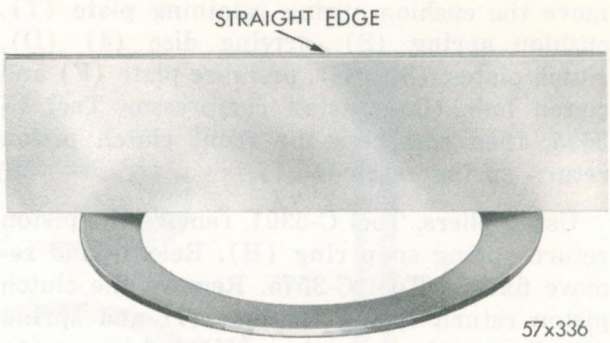


Fig. 116—Identification of Front Clutch Cushion Spring

99. CHECKING FOR PROPER TRAVEL OF CLUTCH PRESSURE PLATE

It is very important that the front clutch pressure plate has the proper amount of travel where levers are used for applying additional pressure to clutch plates. Insufficient travel may cause the clutch plates to drag. Excessive travel may allow slippage of the clutch. To check for proper travel of the clutch pressure plate, proceed as follows: Install the rear clutch pressure plate (which was withheld during the assembly of unit #2) on top of the front clutch pack. Holding this plate firmly in position, insert a feeler gauge between the plate and top disc in the assembly. The total clearance should be from .020 to .040 inches. If the measured clearance is not within these limits, the clutch discs should be replaced with any combination of new discs, (part numbers 1636260, 1636372 or 1636373) to provide for proper clearance (10). Remove the rear clutch pressure plate and install in its proper location in the rear clutch assembly. Install rear clutch snap ring.

Install the front clutch hub, cushion spring retaining plate (T) (Fig. 115), and cushion spring (S) (concave side, as shown in Figure 116, toward retaining plate) (K). The front clutch cushion spring (S) must be preloaded to 500 pounds for assembly. Place front clutch and the input shaft assembly in an arbor press with the rear of the piston retainer resting on a suitable support. Press the input shaft into the clutch retainer until snap ring (B) can be installed. **If arbor press is not available use**

two "C" clamps placed 180° apart as described previously.

Remove the input shaft and front clutch assemblies from the arbor press (or remove "C" clamps) and install the input shaft thrust washer.

SERVOS, BANDS AND MISCELLANEOUS INSPECTION

100. BAND—INSPECTION

All letters referred to in inspection of these parts pertain to Figure 117. Make visual inspection of bands and lining for wear and bond to metal. If lining is worn to the point that grooves are no longer visible, band assemblies must be replaced. The lining is bonded to the band and no attempt should be made to reline them. Inspect bands for distortion or cracked ends. The reverse band is **narrower** than the kickdown band. Therefore, it should be identified to prevent improper installation.

101. LEVER ASSEMBLIES—INSPECTION

Inspect levers (J and K) for being cracked or worn and make sure they are free to turn on shaft and have side clearance when installed. Inspect lever shaft (I) for excessive wear.

102. REVERSE SERVO PISTON ASSEMBLY —INSPECTION

Inspect lever contacting surface on plug (L) for excessive wear. Remove and inspect reverse servo piston seal ring (Z) (neoprene) for deterioration and hardness. Inspect seal ring groove for nicks or burrs. Inspect servo piston return spring (O), retainer (N), and snap ring (M) for being distorted.

103. KICKDOWN PISTON ASSEMBLY— INSPECTION

Inspect riveting of kickdown piston rod (T). Also inspect guide (R) contacting surface for nicks or burrs. Inspect seal ring (CC) on guide for wear and make sure it turns freely in the groove. Check fit of guide (R) on piston rod. Inspect the three rings (two interlocking) on

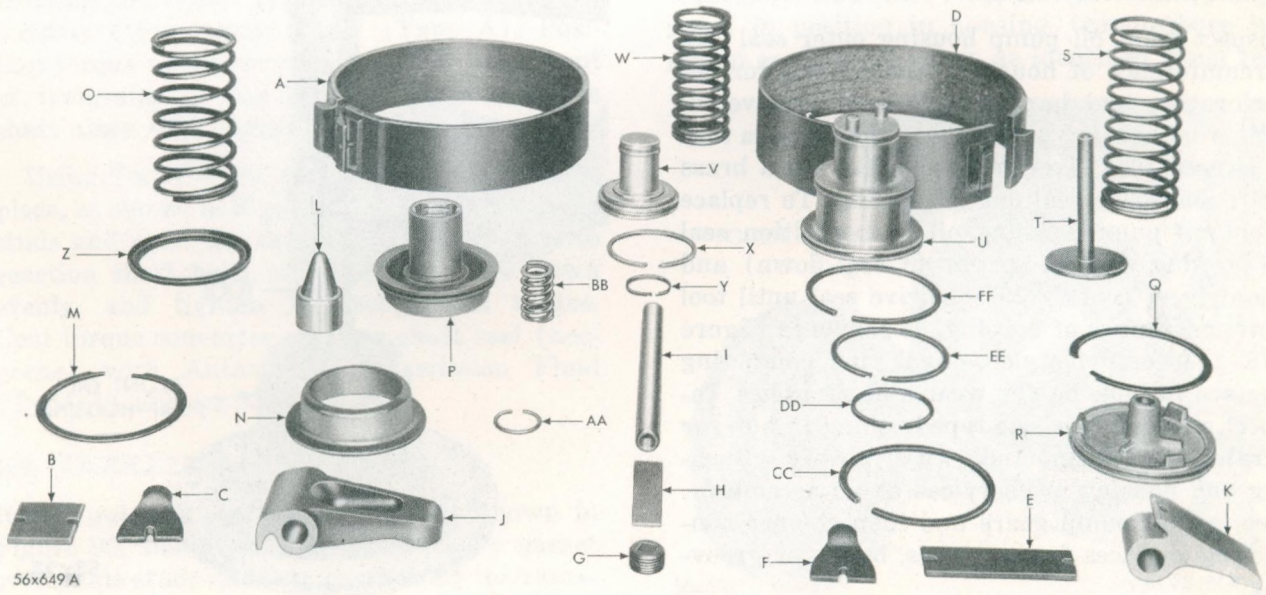


Fig. 117—Servos and Bands (Disassembled View)

piston for wear or broken locks. Make sure they turn freely in the groove. It is not necessary to remove ring unless condition warrants. When replacing new rings, use extreme care so as not to damage the interlocking portion of the ring. Inspect kickdown piston (U) for light scores and wear. Inspect kickdown piston spring (S) and rod guide snap ring (Q) for being distorted.

104. ACCUMULATOR PISTON AND SPRING

Inspect the two seal rings (X and Y) (one interlocking) for wear or broken locks and make sure they turn freely in the grooves. It is not necessary to remove rings unless condition warrants. When replacing new interlocking seal rings, use extreme care so not to damage interlocking portion of ring. Inspect accumulator piston (V) for nicks, burrs, and excessive wear. Inspect the accumulator spring (W) for being distorted.

105. DRIVE SLEEVE

Inspect the front seal ring (neoprene) for nicks, deterioration and hardness. Inspect the interlocking seal ring for wear or broken locks, and make sure it turns freely in the groove. It is not necessary to remove rings unless condition warrants. Inspect driving lugs for excessive wear and bearing surface on outer diameter for nicks, burrs, or scratches.

106. FRONT OIL PUMP

Inspect front oil pump housing outer seal (on circumference of housing) and oil seal for deterioration and hardness. Do not remove oil seal from housing unless inspection reveals that it is necessary. To remove oil seal, use a brass drift and drive seal out of housing. To replace front oil pump housing oil seal, position seal in housing, (metal portion of seal down) and use driver, Tool C-3278 to drive seal until tool bottoms on face of housing, as shown in Figure 118. Inspect drive sleeve seal ring contacting surface in housing for wear and scratches. Inspect steel back bronze type bushing in hub for scratches or scoring and excessive wear. (Bushing and housing are serviced as an assembly). Remove oil pump gears and inspect gear contacting surfaces for scratches, burrs, or grooving.

Inspect regulator body contacting surface on pump housing face for nicks or burrs. Inspect housing passages and make definitely sure they are free from dirt and foreign matter. Clean and install oil pump gears in housing. **Replace gears, as indentified when removed, with counterbore in pinion gear facing down.** Using straightedge, Tool C-3335 and feeler gauge, check clearance between pump housing face and face of gears, as shown in Figure 119. Clearance limits are from .001″ to .0025″. After checking pump gear clearance, lubricate pump gears with Automatic Transmission Fluid (Type A).

107. REGULATOR VALVE BODY AND VALVES

Place body and valves in pan containing a clean solvent, wash thoroughly, and dry with compressed air. Inspect the reaction seal ring surface in bore for scratches, nicks, or burrs. Inspect both valves for free movement in valve body; they should fall in and out of bores when both the valves and body are dry. Crocus cloth may be used to polish valves providing care is exercised not to round the sharp edge portion of the valves. The sharp edge portion is vitally important to this type of valve, it helps to prevent dirt and foreign matter from getting between the valve and body, thus reducing the possibilities of sticking.

Check all fluid passages for obstructions and inspect all mating surfaces for burrs and distortion. If regulator valve body should have a

Fig. 118—Installing Front Pump Housing Oil Seal

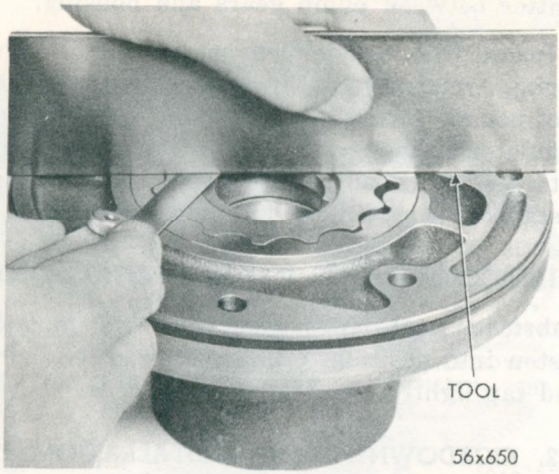


Fig. 119—Checking Clearance between Front Pump Body and Gears

slight nick or raised portion on mating surfaces, it may be removed by using a surface plate and crocus cloth. Inspect front and rear pump check valve for proper seating on both surfaces. Check metering hole for a plugged condition and be sure hole is free of foreign matter. If necessary to remove valve, use a pair of long nose pliers. When installing check valve, make definitely sure rear pump check valve (with metering hole) is positioned toward outside of regulator valve body.

Check regulator valve spring seat (snap ring). After the valves and regulator valve body have been thoroughly cleaned and inspected, the valves should be reinstalled in body, (Fig. 93). **Torque converter control valve has end drilled for removal and installation purposes.** Place assembly on a clean surface and cover until ready for installation. Inspect regulator valve and torque converter control valve springs for distortion. Check regulator valve spring sleeve and cup for burrs. Check adjusting screw and locknut in retainer, for freeness and pulled threads.

ASSEMBLY OF UNITS IN TRANSMISSION CASE

108. TORQUE CONVERTER REACTION SHAFT —INSTALLATION

Using heat lamps, heat front of transmission case to approximately 170 to 190 degrees F. Install guide studs, Tool C-3283 in front face of reaction shaft flange. Lubricate portion of reaction shaft that presses into case with Automatic Transmission Fluid (Type A). Position torque converter reaction shaft into front of transmission case so that guide studs in shaft align with threaded holes in case.

Using Tool C-3431, press reaction shaft into place, as shown in Figure 94. Remove the guide studs and start the three transmission case to reaction shaft bolts and washers, draw down evenly, and tighten 15 foot-pounds torque. Coat torque converter reaction shaft seal (neoprene) with Automatic Transmission Fluid (Type A) and install on shaft.

109. REGULATOR VALVE BODY

Install guide studs, Tool C-3288, as shown in Figure 92. Install regulator valve body gasket over guide studs and into position on the transmission case. With seal ring (neoprene) in position on reaction shaft, install regulator valve body and valves over guide studs and into position. **Hold valves in place to prevent damage while installing valve body.**

110. FRONT OIL PUMP ASSEMBLY— INSTALLATION

With inner and outer seals lubricated and pump gears in position in housing (counterbore in pinion gear facing down as identified when re-

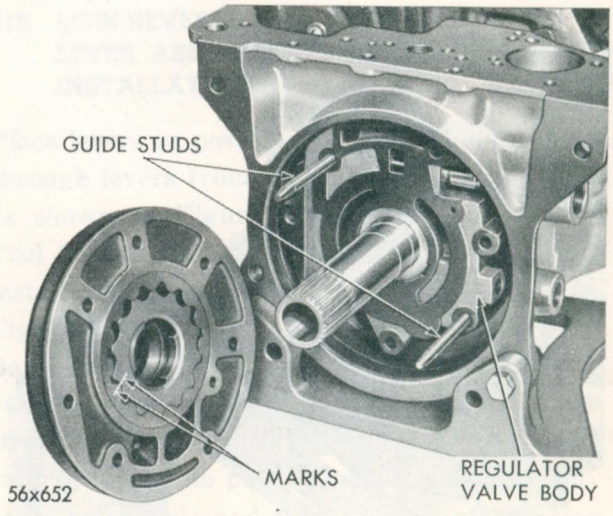


Fig. 120—Installing Front Oil Pump Assembly

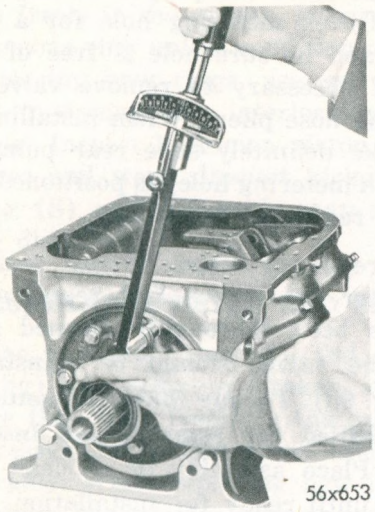


Fig. 121—Tightening Front Oil Pump Housing Screws

moved), place oil pump housing over studs and slide into position, as shown in Figure 120. Start five of the bolts (with aluminum washers) and **draw housing down evenly** until it is seated into transmission case. Remove guide studs and install the two remaining bolts and washers, then tighten to 16 foot-pounds, as shown in Figure 121. **Improper tightening of these bolts may cause pump gears to bind.** Lubricate and install front pump drive sleeve (bearing surface first), as shown in Figure 122, then engage the driving lugs of the oil pump pinion to determine if oil pump gears turn freely (main body of driving sleeve should be flush with oil pump housing when properly installed), (Fig. 123). If gears do not turn freely, remove pump and check for foreign matter between pump gears and housing.

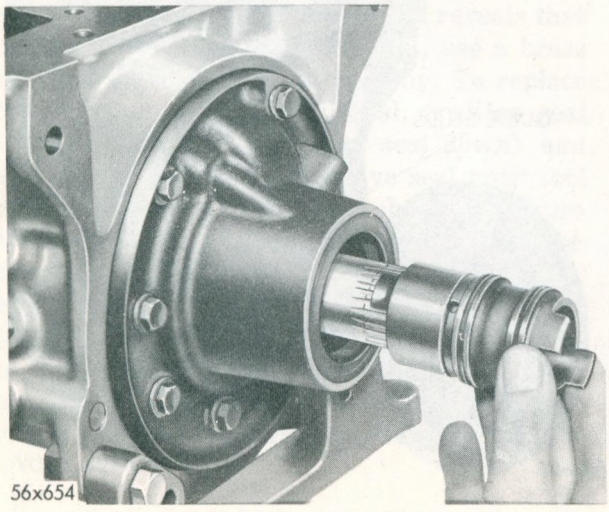


Fig. 122—Installing Front Oil Pump Drive Sleeve

Install the torque converter control valve spring, retainer, and gasket. Tighten to 40 foot-pounds torque. Reinstall the transmission regulator valve spring, sleeve, cup, gasket and retainer (with adjusting screw and lock nut installed). Tighten 50 foot-pounds torque.

111. ACCUMULATOR PISTON—INSTALLATION

Lubricate seal rings and place accumulator piston into position. Compress outer seal ring and tap lightly into transmission case.

112. KICKDOWN PISTON—INSTALLATION

Lubricate piston seal rings and place kickdown piston assembly into position, compress outer ring, and start assembly into case. With piston properly centered so not to damage rings, tap lightly and bottom piston into case. Place kickdown piston rod assembly in piston and slide piston spring over kickdown piston rod. Install Tool C-3529 or C-3289 (modified) for kickdown piston installation.

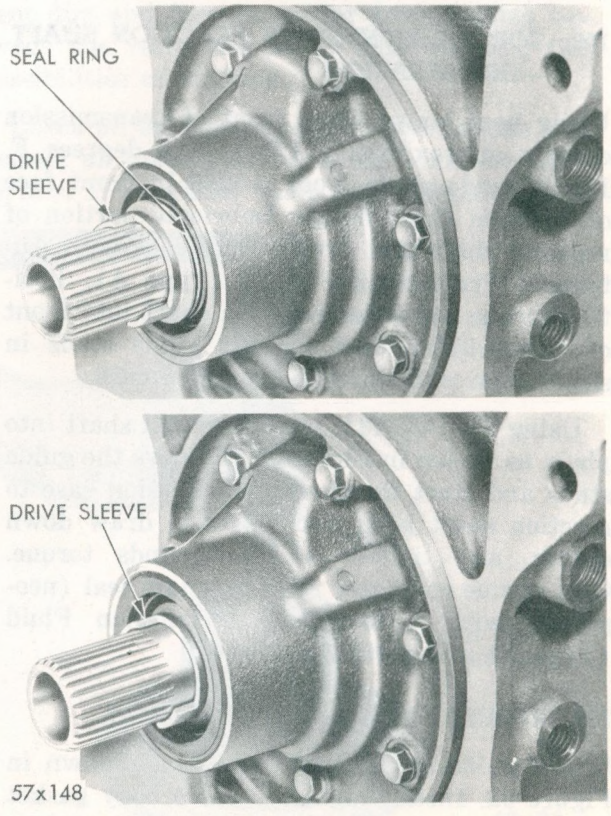


Fig. 123—Front Pump Drive Sleeve—Installation—
Incorrect Installation (Top View)
Correct Installation (Bottom View)

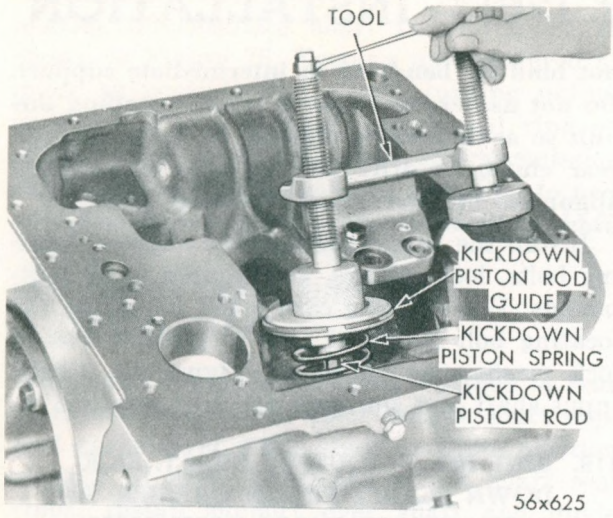


Fig. 124—Removal and Installation of Kickdown Piston Rod Guide and Spring

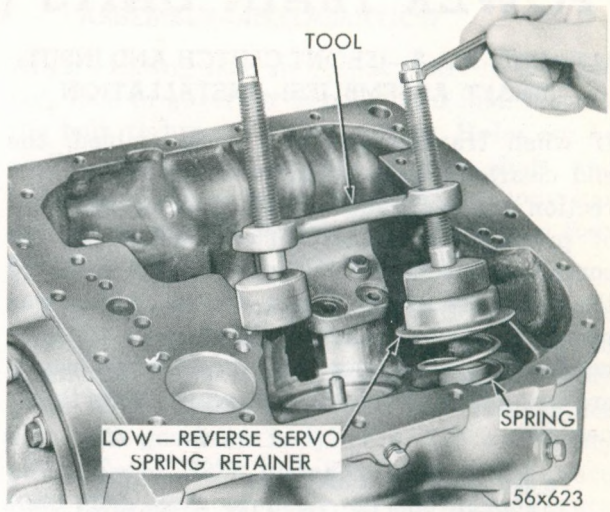


Fig. 125—Compressing Low and Reverse Servo Spring and Retainer

Place the kickdown piston rod guide over spring and compress spring until piston rod enters piston rod guide, as shown in Figure 124. Using extreme care, compress the kickdown piston spring to the point that piston rod guide seal ring slightly binds on case. Then work seal ring into position by gradually compressing spring. Install snap ring and make sure it is properly seated, as shown in Figure 86. Loosen compressing portion of tool and remove.

113. REVERSE SERVO PISTON—INSTALLATION

Lubricate the low reverse servo piston seal ring and install on piston (lip of seal facing end of piston). Install cushion spring and plug into servo piston and secure with snap ring. (Make sure snap ring seats properly). Install piston assembly into transmission case.

Place reverse servo piston spring over piston and position spring retainer over spring. Install Tool C-3429 or C-3489 (modified) for reverse servo piston installation. Compress spring (Fig. 125) sufficiently to install snap ring. Spring retainer may require guiding into case. **Make sure snap ring seats properly.** Loosen compressing portion of tool and remove from transmission case.

114. KICKDOWN BAND—INSTALLATION

Install the kickdown band assembly by rotating band ends over center support in transmission case, as shown in Figure 82. **Use extreme care when installing bands so not to damage lining on edges of transmission case.** Install anchor on kickdown band adjusting screw.

115. LOW-REVERSE BAND—INSTALLATION

Install anchor on reverse band adjusting screw. Install band by rotating band ends through rear opening in transmission case, as shown in Figure 80.

116. LOW-REVERSE AND KICKDOWN BAND LEVER ASSEMBLIES AND STRUTS—INSTALLATION

Place levers in position in case and slide shaft through levers from rear of transmission case, as shown in Figure 83. Remove guide stud, Tool C-3288 from threading end of shaft and install shaft lever spacer (flat) and plug. Tighten plug from 30 to 35 foot-pounds. Position kickdown band over anchor and compress band in sufficiently to install kickdown band strut, as shown in Figure 81. Then place low-reverse band into position on anchor and compress band end; and with the aid of a screw driver, install strut.

POWER TRAIN UNITS (Fig. 126) – INSTALLATION

117. UNIT NO. 3—(FRONT CLUTCH AND INPUT SHAFT ASSEMBLIES)—INSTALLATION

If when transmission was disassembled, the end clearance was found to be incorrect, correction can be made at this time by selection of proper input shaft thrust washer. To accomplish this, use a micrometer and measure the thickness of the thrust washer which was removed. Then, select a thicker or thinner washer to give proper clearance. Thrust washers are available in the following three thicknesses:

Part No.	Thickness	Color
1638669	.115″ to .117″	Natural
1638670	.097″ to .099″	Black
1638671	.078″ to .080″	Red

With input shaft thrust washer in position and input shaft seal rings lubricated, start unit through rear of transmission case, as shown in Figure 79. By supporting and keeping unit centered as much as possible, guide through bands and reaction shaft into position.

118. UNIT NO. 2—(SUN GEAR, REVERSE PLANET PINION CARRIER, OVERRUNNING CLUTCH, AND REAR CLUTCH ASSEMBLIES—INSTALLATION

Start unit through rear of transmission case. Align identified locating hole in intermediate support with threaded locating hole inside of transmission case, as shown in Figure 127. By supporting and keeping unit centered as much as possible, guide it through bands until it contacts the hub on the front clutch. While pushing in on assembly, rock sun gear to engage clutch plates of rear clutch on hub of front clutch.

While rocking sun gear, make sure unit does not bind on bands or in intermediate support. Do not use excessive force when installing this unit so as to prevent damage to clutch discs in rear clutch. A drift may be used to assist in alignment of intermediate locating holes.

Install the three intermediate support locating bolts, lockwashers, and tighten to 30 foot-pounds. Use extreme care when installing the locating bolt inside of case to prevent loss of lock washer, as shown in Figure 77. Check input shaft and sun gear for free rotation.

119. UNIT NO. 1—(OUTPUT SHAFT, KICK-DOWN PLANET PINION CARRIER, AND INTERMEDIATE SHAFT ASSEMBLIES)—INSTALLATION

Be sure reverse sun gear thrust washer (roller type) is in position in planet pinion carrier assembly. Lubricate seal rings and bearing surface on intermediate shaft with Automatic

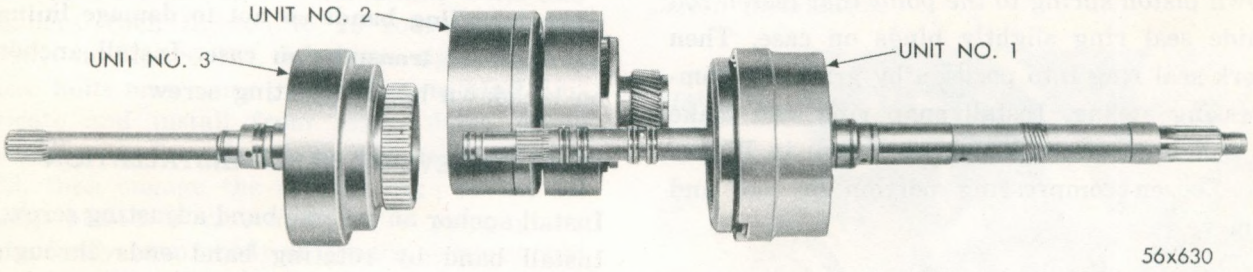


Fig. 126—Power Train Units

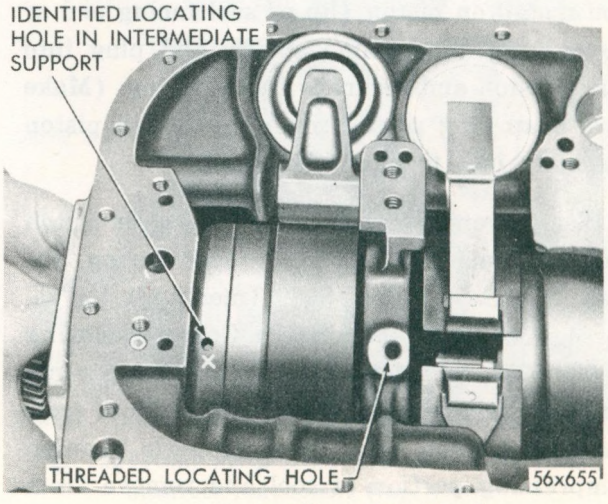


Fig. 127—Installing Unit No. 2

Transmission Fluid (Type A). Install unit by placing intermediate shaft in sun gear, as shown in Figure 76. Keeping unit centered as much as possible and slowly turning output shaft, slide into position (large seal ring on output shaft flush with rear of transmission case). **Use extreme care when installing to prevent damage to seal rings on intermediate shaft.**

120. OUTPUT SHAFT SUPPORT—INSTALLATION

With guide studs Tool C-3283 installed in rear of transmission case, place output shaft support gasket over guide studs and into position on rear of case. Lubricate output shaft seal rings. Install support over shaft and guide studs, and position against transmission case, as shown in Figure 75. **Use care when installing support so not to damage ring sealing surfaces.** Install the one (short) output shaft support to transmission case bolt and lockwashers, and tighten finger tight.

121. REAR OIL PUMP AND GOVERNOR ASSEMBLIES—INSTALLATION

Place rear oil pump pinion ball in ball pocket in output shaft. Lubricate rear oil pump drive pinion. Place over output shaft and slide into position aligning key way in pinion with ball in shaft, as shown in Figure 74. **Pinion was marked when removed in disassembly. Make sure it is installed correctly.**

Lubricate rear oil pump gear and position in pump housing. Make sure gear is installed correctly; check marking. Slide rear oil pump and governor assemblies over output shaft and position against support, as shown in Figure 73. **There are two extra holes in housing which are used for vents. Make definitely sure that no attempt is made to install bolts in these holes. Check each threaded hole before installing bolts.** Install the five rear oil pump housing to output shaft support bolts and washers.

Dished type washers are used to prevent cutting or chipping of soft metals and should be installed on bolts with dished portion facing away from bolt head. Draw down evenly, tighten to 12 foot-pounds torque. **After bolts have been properly tightened, turn output shaft to make sure pump gears are free to rotate. If not, disassemble pump to determine cause.**

122. GOVERNOR WEIGHTS AND VALVE ASSEMBLY—INSTALLATION

Align locating hole in output shaft to locating bolt hole in governor support and install locating bolt, tighten to 7 foot-pounds. **Holes can be easily aligned by turning output shaft and holding governor body.** If governor body has been removed and reinstalled, tighten the four governor body bolts to 8 foot-pounds.

Dry governor weight assembly and valve with compressed air, but do not lubricate when assembling. Place governor weight assembly (Fig. 128) (secondary weight snap ring facing out) into governor body (Fig. 72) and using pliers, Tool C-3229, install snap ring. Make sure snap ring seats properly, as shown in Figure 71. With the governor valve (small end up) on governor valve shaft, slide shaft into governor body, as shown in Figure 70 through the output shaft and governor weight assembly; at the same time position valve body.

Install the governor valve shaft snap ring (from weight assembly end). Make sure it is properly locked to shaft, as shown in Figure

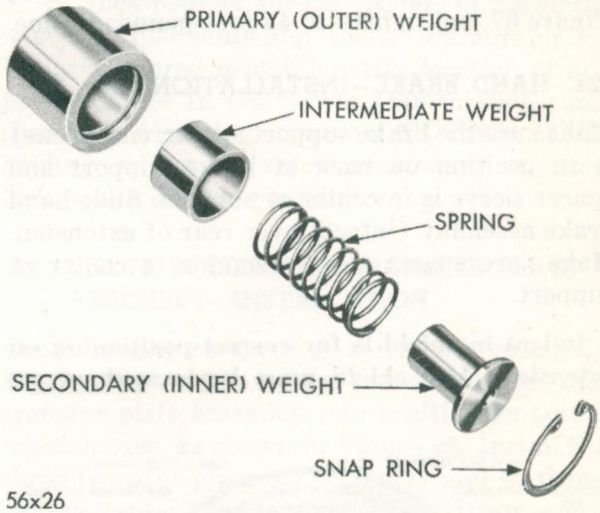


Fig. 128—Governor Weight Assembly (Disassembled View) (Typical)

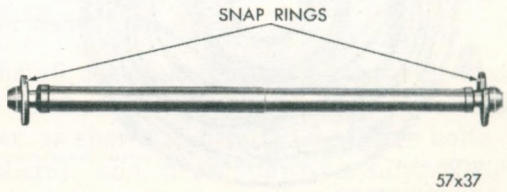


Fig. 129—Positioning Governor Valve Shaft Snap Rings in Grooves

69. **After snap ring installation, apply sufficient pressure to both ends of the valve shaft to force snap rings to outer portion of snap ring grooves. (See Fig. 129).** Check operation of governor weight assembly and valve by turning output shaft. Both should fall freely in governor body.

123. TRANSMISSION EXTENSION—INSTALLATION

Install new transmission extension gasket over guide studs and into position against output shaft support. Do not use sealing material on gasket. Place extension over output shaft and guide studs and into position against support. **Propeller shaft flange and drum assembly can be used if necessary to draw extension bearing on output shaft. Do not use hammer.**

Start the seven transmission extension to case bolts and lockwashers, then draw down evenly and tighten to 30 foot-pounds torque. **After these bolts have been properly torqued, turn output shaft to make sure it turns freely.** Install speedometer drive pinion and sleeve assembly in transmission extension, as shown in Figure 67 and tighten to 45 foot-pounds torque.

124. HAND BRAKE—INSTALLATION

Make sure the brake support spacer (neoprene) is in position on back of brake support and spacer sleeve is in center of support. Slide hand brake assembly (intact) over rear of extension. Make sure spacer sleeve remains in center of support.

Indent in shield is for correct positioning on extension. Also shield must be located on extension far enough to permit installation of spring.

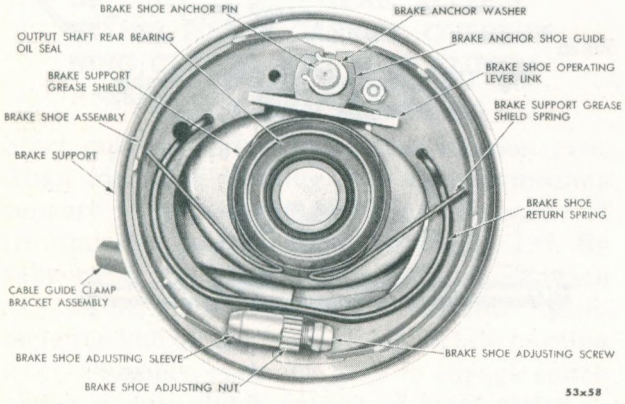


Fig. 130—Internal Expanding Handbrake (Drum Removed)

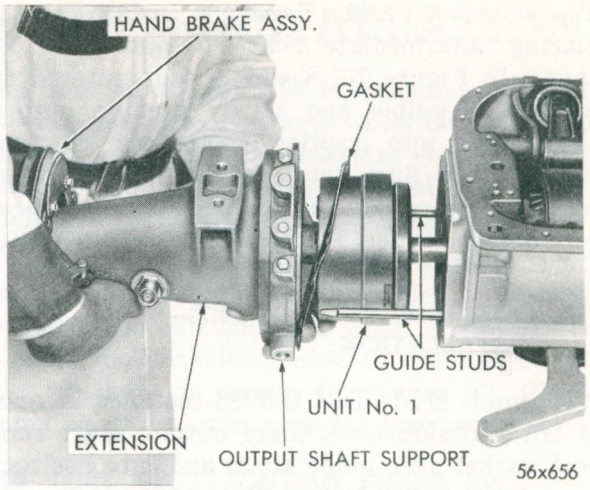


Fig. 131—Removal of Output Shaft Support, Extension, Handbrake Assembly and Unit No. 1 as an Assembly

Install the brake support grease shield spring (opening in spring toward adjusting sleeve). Make sure spring is properly seated in groove. Slide the brake shoe return spring behind the grease shield spring and hook into position, as shown in Figure 130. Reinstall pin through brake anchor and extension. Install propeller shaft flange and drum assembly. Omit this operation if flange and drum assembly were used to force bearing on output shaft. Install the propeller shaft flange washer and nut. Tighten to 175 foot-pounds torque. Use wrench, Tool C-3281 to hold brake drum and flange assembly while tightening nut.

125. RECHECKING FRONT CLUTCH END CLEARANCE

Prior to installing the valve bodies and transfer plate assembly, recheck front clutch end clearance using dial indicator, Tool C-3339, as shown in Figure 64. To make this check, pry front clutch forward by carefully inserting screw driver between the front and rear clutch. Remove screw driver and with dial indicator, point contacting edge of front clutch retainer set dial indicator to zero. Then pry front clutch assembly rearward against rear clutch, remove screw driver, and take indicator reading. This clearance should be from .020″ to .050″. If the clearance is not within these limits, then transmission will have to be partially disassembled in the following manner to allow an input shaft thrust washer of proper thickness to be installed.

Remove the seven bolts and lockwashers from the transmission extension and install guide studs, Tool C-3283. Then, remove the one output shaft support to transmission case bolt and washer, and remove the hand brake assembly, extension, output shaft support, and Unit No. 1 as one assembly, as shown in Figure 131. **Support assemblies as much as possible when removing to prevent damaging seal rings on intermediate shaft. Refer to "Power Train Units—Removal." Unit No. 2 and Unit No. 3.**

Using a micrometer, measure the thickness of the input shaft thrust washer and select a washer to give correct clearance. Thrust washers are available in the following three thicknesses:

Part No.	Thickness	Color
1638669	.115″ to .117″	Natural
1638670	.097″ to .099″	Red
1638671	.078″ to .080″	Black

Install power train units refer to "Power Train Units—Installation"; Unit No. 3, and Unit No. 2.

Install hand brake assembly, extension, output shaft support, and Unit No. 1 in one assembly as removed, following the procedure as described in the installation of Unit No. 1. With assembly in position in transmission case, install the one support to case bolt and lockwasher finger tight. Remove the guide studs and install the seven extension to case bolts and lockwashers, draw down evenly and tighten to 30 foot-pounds torque. Tighten after bolts have been properly torqued, turn output shaft to make sure it turns freely. Recheck front clutch end clearance.

126. BAND ADJUSTMENT

Since both band assemblies have been removed, it is very important that the hand brake drum is turned in a clockwise and counter-clockwise direction to center bands on retainers prior to making band adjustments.

127. LOW-REVERSE (REAR) BAND

Using wrench, Tool C-3380 and with lock nut loose, tighten low-reverse band adjusting screw to 75 inch-pounds torque, as shown in Figure 132. Refer to "Maintenance Adjustments and Test," Paragraph 24.

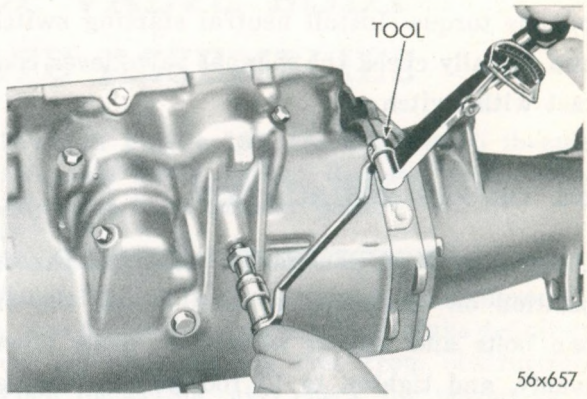


Fig. 132—Adjusting Low-Reverse Band

Using a colored pencil, identify adjusting screw, location in relation to transmission case. Back adjusting screw out 2⅝ turns. Holding adjusting screw stationary, tighten lock nut to 40 foot-pounds torque.

128. KICKDOWN (FRONT) BAND

Using wrench, Tool C-3380 (and with lock nut loose), tighten kickdown band adjusting screw to 75 inch-pounds torque. Refer to "Maintenance, Adjustments and Tests," Paragraph 24. Using a colored pencil, identify location of adjusting screw in relation to transmission case, then back adjusting screw out 3½ turns. While holding adjusting screw stationary, tighten lock nut to 40 foot-pounds torque.

129. VALVE BODIES AND TRANSFER PLATE ASSEMBLY—INSTALLATION

Check mating surfaces of valve body assembly for cleanliness. Then place the valve bodies and transfer plate assembly into position on transmission case, as shown in Figure 63. Install the three transfer plate bolts (short) and washers, two in center, and one in front. Draw down evenly and tighten to 16 foot-pounds torque. **Dished type washers are used to prevent cutting or chipping of soft metals and should be installed on bolts with dished portion facing away from head.**

Install accumulator spring through transfer plate and position in piston. Install accumulator cover, as shown in Figure 62, (three bolts, with washers) and draw down evenly. Place oil strainer assembly in position on transfer plate assembly. Install the four bolts and washers, draw down evenly, and tighten strainer assem-

bly and accumulator cover bolts to 16 foot-pounds torque. Install neutral starting switch and visually check the manual valve lever contact with switch.

130. OIL PAN—INSTALLATION

Using a new oil pan gasket, place oil pan in position on transmission case. Install the oil pan bolts and washer asemblies; draw down evenly, and tighten to 12 foot-pounds torque. Position lever so there is 7/32 inch clearance (without gasket) between bottom of lever and transmission case. Tighten locking screw securely. **A 7/32 inch drill can be used for obtaining proper clearance, (Fig. 51).** Place control cable adapter (with spring lock in position) in lever and install pin. Place manual valve control lever in reverse position and install gasket, control cable housing, and three bolts and washers. Draw down evenly and tighten to 16 foot-pounds torque. Install felt washer, flat washer, and throttle valve lever assembly over shaft and tighten clamping bolt.

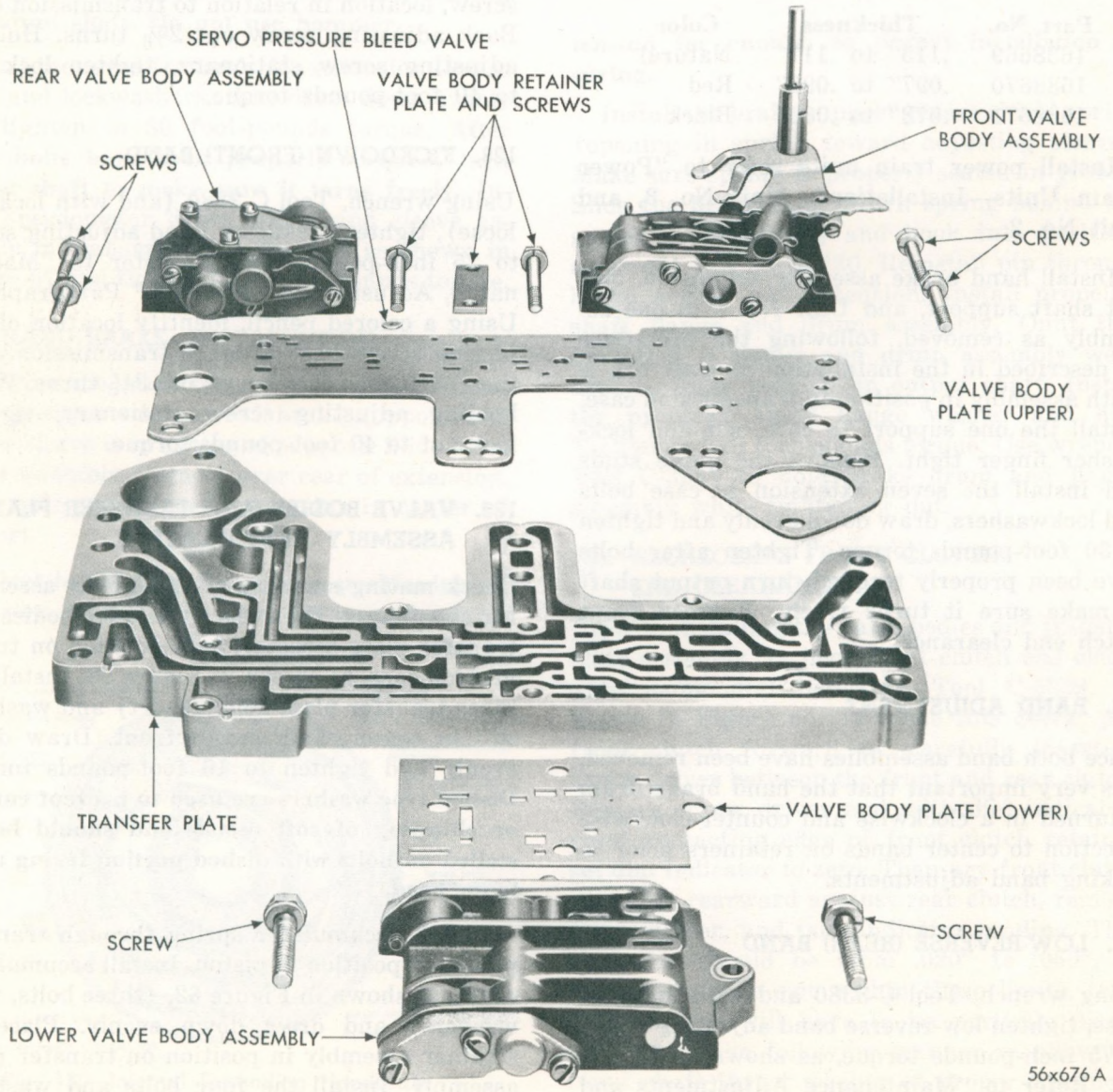


Fig. 133—Valve Bodies and Transfer Plate (Separated)

RECONDITIONING OF VALVE BODY AND TRANSFER PLATE ASSEMBLIES

131. LOWER VALVE BODY—REMOVAL

Place the valve bodies and transfer plate assembly in stand, Tool C-3528. **Never clamp any portion of any valve body assembly in a vise or use force when removing or installing valves and plugs.** Remove the two valve body bolts (long) from retainer plate located between front and rear valve bodies, as shown in Figure 133, and remove plate. Invert valve bodies and transfer plate and remove the two lower valve body bolts and lockwashers. Remove lower valve body and plate from transfer plate, as shown in Figure 134. **Use extreme care to prevent loss of governor compensator valve plug retaining pin.**

132. REAR VALVE BODY—REMOVAL

Remove the two transfer plate to rear valve body bolts and lockwashers, and remove rear valve body from transfer plate assembly, as shown in Figure 135. **Remove the servo pressure bleed valve to prevent loss.** Invert valve bodies and transfer plate assembly and replace on stand Tool C-3428.

133. FRONT VALVE BODY—REMOVAL

Remove the two front valve body to transfer plate bolts and lockwashers and separate front valve body from transfer plate assembly, as shown in Figure 136. **Do not disturb throttle valve stop screw setting. Remove upper valve body plate from transfer plate.**

134. CLEANING AND INSPECTION

Place all parts in clean solvent, wash thoroughly, and dry with compressed air. Make definitely sure all passages are free from obstruction. When inspecting, also check for porous castings. Inspect all mating surfaces for burrs, nicks and grooves. Small ones may be removed with crocus cloth; otherwise, damaged parts must be replaced. Using straight edge, Tool C-3335, check all mating surface for distortion.

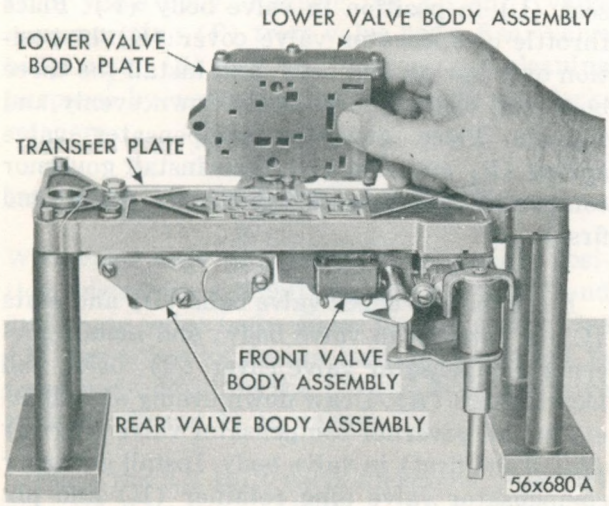


Fig. 134—Removal and Installation of Lower Valve Body Assembly and Plate

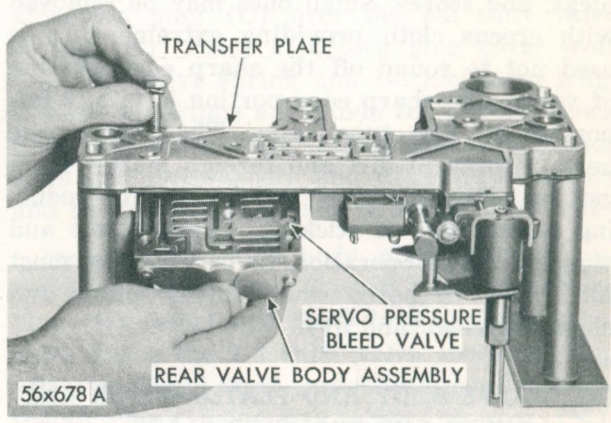


Fig. 135—Removal and Installation of Rear Valve Body Assembly

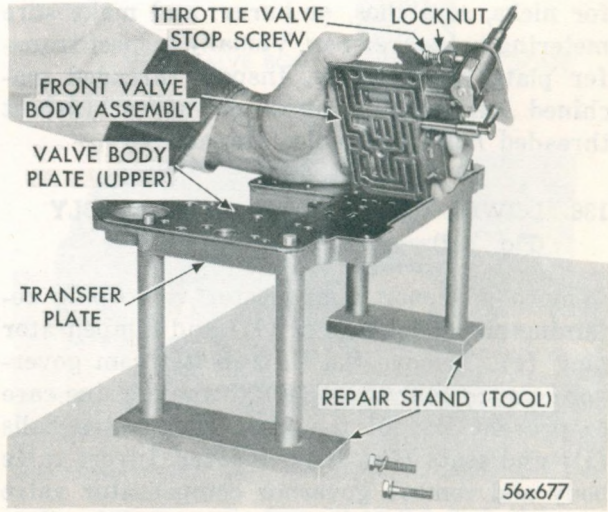


Fig. 136—Removal and Installation of Front Valve Body Assembly

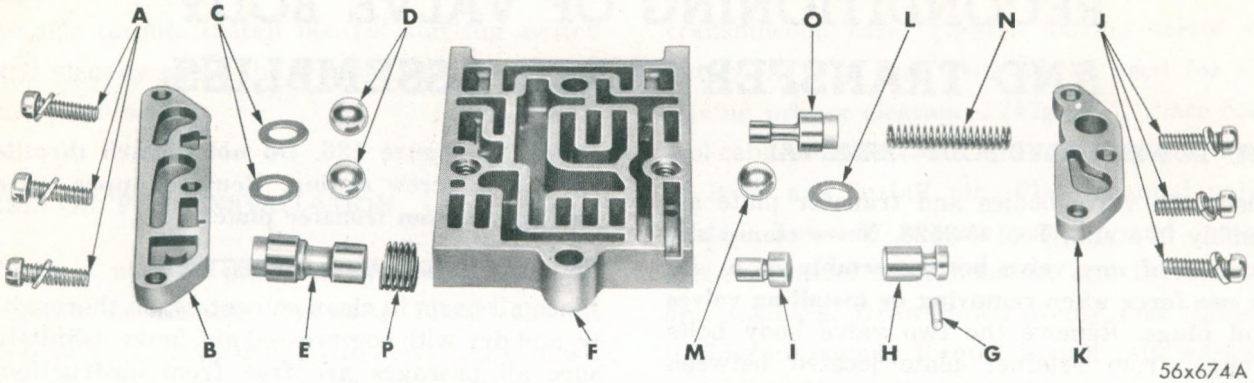


Fig. 137—Lower Valve Body (Disassembled View)

Using a pen light, inspect bores in valve body for score marks, pits, and irregularities. Inspect all springs for distortion and collapsed coils. Inspect all valves and plug for burrs, nicks, and scores. Small ones may be removed with crocus cloth providing extreme care is used not to round off the sharp edge portion of valve. The sharp edge portion is vitally important to this type valve. The sharp edge helps to prevent dirt and foreign matter from getting between valves and body, thus reducing possibilities of sticking. Check valves and plugs for free operation in bores; they must fall freely in bores when valves, plugs and bores are clean and dry.

135. VALVE BODY AND PLATES (UPPER AND LOWER) AND TRANSFER PLATE—INSPECTION

Inspect valve body plates (upper and lower) for nicks, scratches, or burrs; and make sure metering holes are open. Visually inspect transfer plate for porosity. Inspect threaded machined surface for nicks or burrs. Inspect threaded holes for pulled threads.

136. LOWER VALVE BODY—DISASSEMBLY (Fig. 137)

Remove governor compensator valve plug retaining pin (G), retainer (H) and compensator plug (I). Remove the three bolts from governor compensator cover (B) (large). Using care to prevent loss of the two check valve balls (D) and seats (C), remove cover. Invert valve body and remove governor compensator valve (E) and valve spring (P).

While holding throttle compensator valve cover (K) in place (spring loaded), remove the three bolts and lockwashers (J). **Use care when removing cover to prevent loss of check valve ball (M) and seat (L).** Remove throttle compensator valve spring (N) and valve (O).

136. LOWER VALVE BODY—ADDITIONAL INSPECTION

Inspect check ball contacting surface in valve seats and valve body for nicks or burrs. Inspect covers for flatness and porosity.

137. LOWER VALVE BODY—ASSEMBLY (Fig. 137)

Place valve body in an upright position and install throttle compensator valve (O) and spring (N). Make sure spring is properly seated in valve. Place check ball (M) and ball seat (L) in position in valve body (F). Place throttle compensator valve cover (K) in position over spring and body, and install the three bolts and lockwashers. Draw down evenly and tighten. Place governor compensator valve spring (P) on valve (E) then install governor compensator valve into valve body (small end first).

Place the two check valve balls (D) and seats (C) in position in valve body; and install governor compensator valve cover (B), bolts, and lockwashers (A). Draw down evenly and tighten. Install governor compensator valve plug (I) (small end first) in valve body. Install governor compensator valve plug retainer (H) and pin (G). **Use care when handling valve body to prevent loss of retainer pin.**

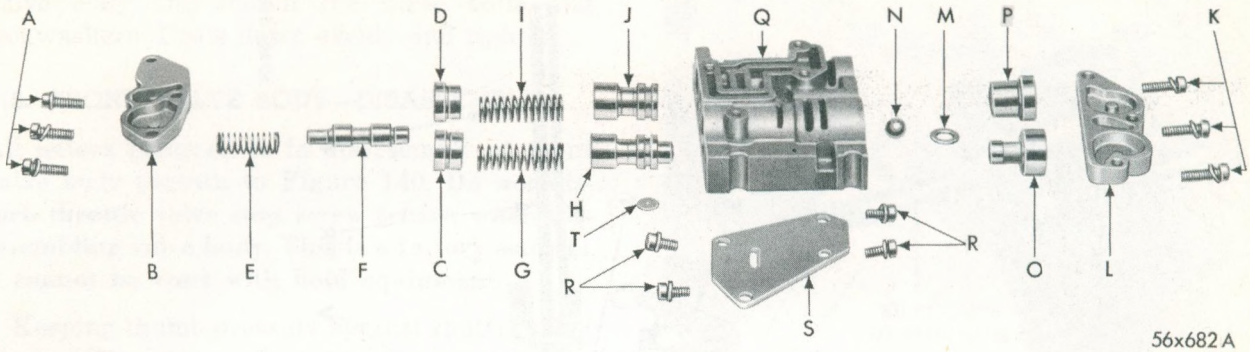


Fig. 138—Rear Valve Body (Disassembled View)

138. REAR VALVE BODY—DISASSEMBLY (Fig. 138)

Keeping thumb pressure against the kickdown plug cover (spring loaded) remove the three bolts and lockwashers.

CAUTION

Use caution when removing cover to prevent loss of the 3-1 relay valve spring (E) 1-2 shift valve kickdown plug (C) and 2-3 shift valve kickdown plug (D).

Remove the 1-2 shift valve spring (G) and valve (H). Remove the 3-1 relay valve (F). Remove the 2-3 shift valve spring (I) and valve (J). Remove the three governor plug cover bolts and lockwashers (K). **Use caution when removing cover (L) to prevent loss of check valve ball seat (M) and ball (N).** Remove the 1-2 shift valve governor plug (O) from valve body. Remove the 2-3 shift valve governor plug (P) from valve body. Rear valve body plate (S) can be removed for cleaning purposes by removing the four bolts and lockwashers.

139. REAR VALVE BODY—ASSEMBLY

With valve body (Q) setting in an upright position, install the 1-2 shift valve (H) (small end first) into valve body. Place the 2-3 shift valve (J) (spring pilot facing out) into position in valve body. Position the 1-2 and 2-3 shift valve springs (G and I) in valves.

Place the 2-3 shift valve kickdown plug (D) (identified by larger pilot) over 2-3 shift valve spring (I). Compress spring sufficiently to seat plug in valve body and secure by placing a thin piece of metal (6″ scale) behind plug, as shown in Figure 139. Install the 3-1 relay valve (F) (large end first) into valve body and place spring (E) on pilot. Place the 1-2 shift valve kickdown plug (C) over the 1-2 shift valve spring (G). Place kickdown plug cover over 3-1 relay valve spring and 1-2 kickdown plug. Compress springs and guide the 1-2 kickdown plug into valve body. Install the three cover bolts and lockwashers and draw down evenly and tighten. Remove piece of metal or 6″ scale.

Install rear valve body plate (S) (if removed). Place the 1-2 shift valve governor plug (Q) (small end first) in position in valve body. Place the 2-3 shift valve governor plug (P) (small end first) in position in valve body. Install check valve ball (N) and seat (M). Place governor plug cover (L) in position on

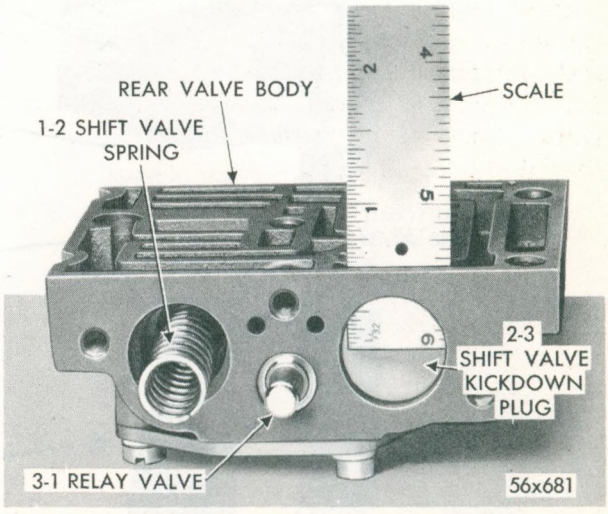


Fig. 139—Using Scale to Hold 2-3 Shift Valve Kickdown Plug in Body During Assembly

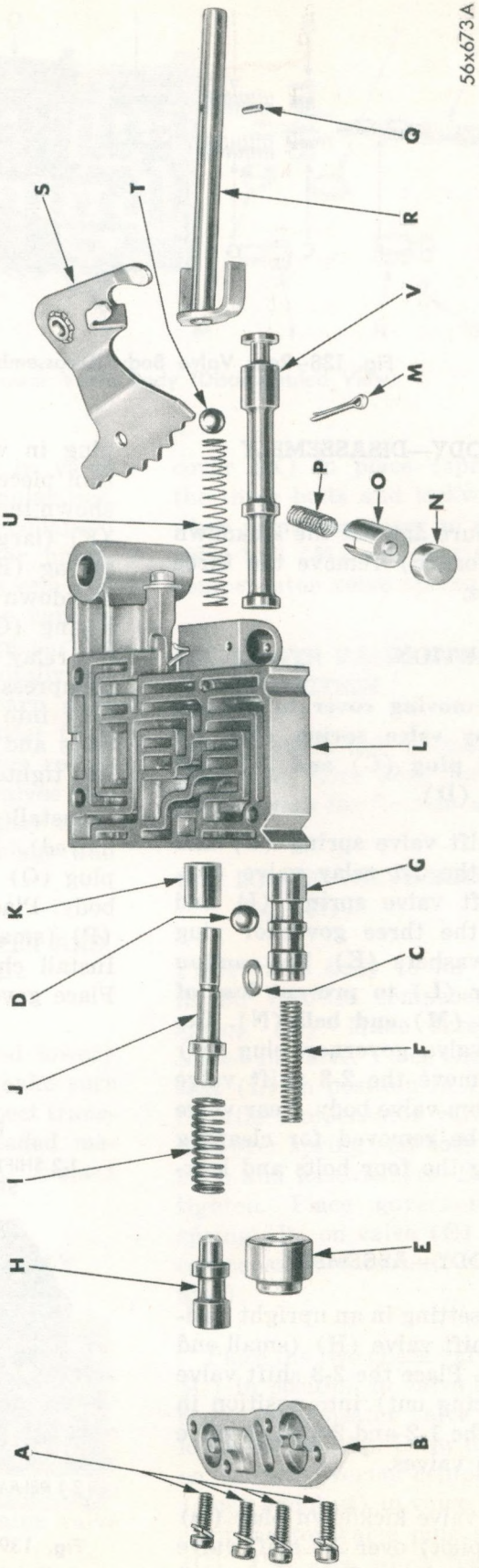


Fig. 140—Front Valve Body (Disassembled View)

valve body and install the three bolts and lockwashers. Draw down evenly and tighten.

140. FRONT VALVE BODY—DISASSEMBLY

All letters referred to in disassembly of front valve body pertain to Figure 140. **Do not disturb throttle valve stop screw setting when disassembling valve body. This is a factory setting: it cannot be reset with field equipment.**

Keeping thumb pressure against shuttle valve cover (B) (spring loaded) remove the four bolts and lockwashers. Use caution when removing cover to prevent loss of front check valve ball seat (C) and ball (D). While holding thumb over throttle valve, invert valve body and remove shuttle valve plug, spring and valve, as shown in Figure 141.

Remove throttle valve, spring kickdown valve, and detent plug, as shown in Figure 142. It is unnecessary to remove detent plug retaining bolt and lockwasher. Remove cotter pin from valve body in outer end of reverse blocker valve. Remove reverse blocker valve plug (N), blocker valve (O), and spring (P). Normally it isn't necessary to remove the throttle valve lever shaft (R) manual valve lever assembly (S) or manual valve (V). If condition warrants, however, (such as damage), proceed as follows:

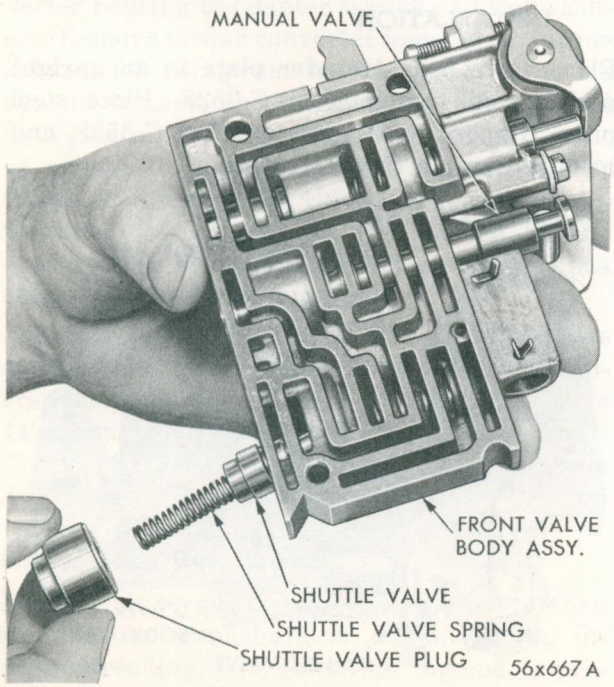


Fig. 141—Removal and Installation of Shuttle Valve, Plug, Spring and Valve

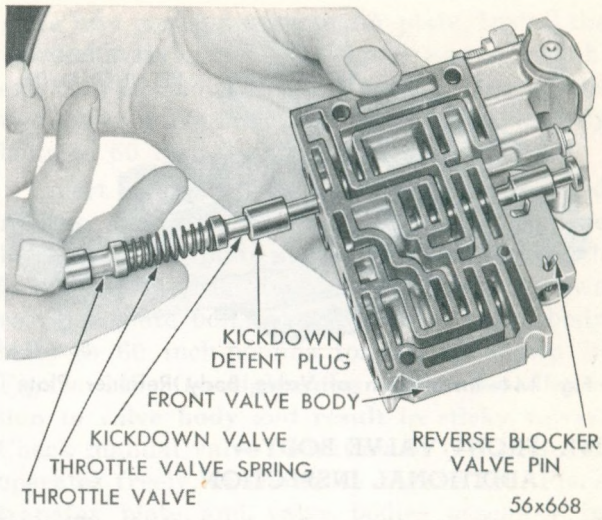


Fig. 142—Removal and Installation of Throttle Valve, Spring, Kickdown Valve and Detent Plug

Support throttle lever shaft on block of wood. Using a small punch and hammer remove the throttle valve lever shaft pin, as shown in Figure 143. **A rubber band may be used to hold manual lever in place while removing pin.**

Remove any burrs from throttle valve and manual valve lever shafts and slide them from valve body. Slide throttle valve lever shaft (R) out of manual lever assembly (S). Using caution to prevent loss of detent ball (T) and spring (U), remove manual valve lever assembly (S) from valve body. Using a twisting motion, remove manual valve (Y).

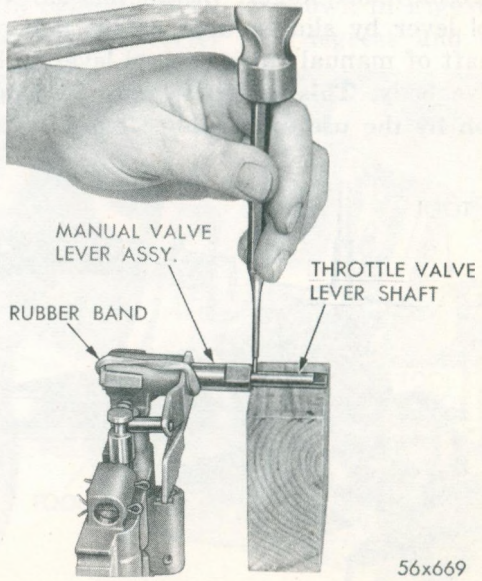


Fig. 143—Removal and Installation of Throttle Valve Lever Shaft Pin (Typical View)

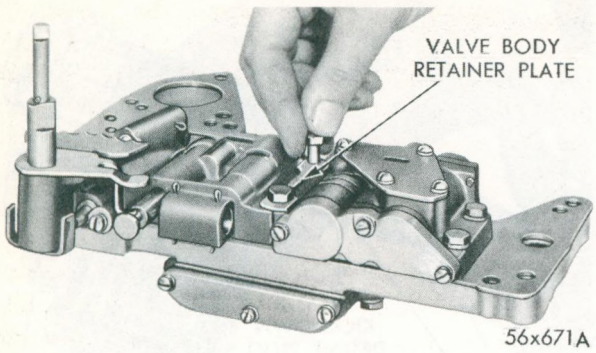


Fig. 144—Installation of Valve Body Retainer Plate

141. FRONT VALVE BODY—ADDITIONAL INSPECTION

Inspect the manual valve detent ball (T) and make sure it slides freely into valve body. Inspect staking of manual lever and throttle cam to their respective shafts. Inspect kickdown valve detent plug to make sure it slides freely on valve. Inspect check valve ball seat in valve body (faulty casting).

142. FRONT VALVE BODY—ASSEMBLY

Place valve body on a piece of clean paper in an upright position. Using a twisting motion, install manual valve (V) until it bottoms on paper. Place manual valve lever detent ball spring (U) and ball (T) in position in valve body.

While compressing detent ball in position with right index finger, install manual valve control lever by sliding over detent ball placing shaft of manual valve control lever in bore of valve body. **This assembly may be held in position by the use of a rubber band.**

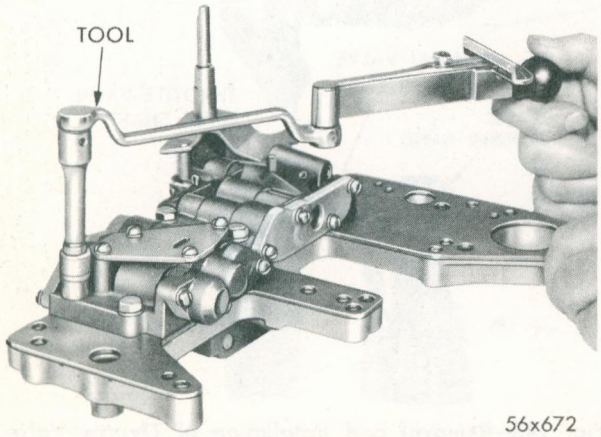


Fig. 145—Tightening Valve Body Screws

While holding manual lever assembly in position against valve body, install throttle valve lever assembly through manual valve lever assembly, with flat portion on end of shaft facing away from valve body (to allow maximum travel of lever). While holding levers in position in valve body with rubber band, support throttle lever shaft on wooden block. Install shaft pin using a small punch and hammer, as shown in Figure 143. Remove rubber band.

With reverse blocker valve spring in position in valve (O) and with slots in valve aligned with pin, install reverse blocker valve in valve body. Install reverse blocker valve plug (N) and compress spring sufficiently to install pin (M). Lock pin in position. Check kickdown detent plug stop screw for being tight. Install detent plug (larger inner diameter first) on kickdown valve (J) and position kickdown valve (detent plug first) into valve body.

Install throttle valve spring (I) and throttle valve (H) into valve body. Install shuttle valve (G) and spring (F) in the valve body. Install plug (E) into position in valve body. Place front check valve ball (D) and seat (C) in position in valve body. Place shuttle valve cover (B) in position on valve body and install four bolts and lockwashers. Draw down evenly.

143. VALVE BODY PLATE (UPPER)—INSTALLATION

Place valve body transfer plate in an upright position on fixture Tool C-3528. Place steel plate (upper) over pilots on Tool C-3528, and into position on transfer plate.

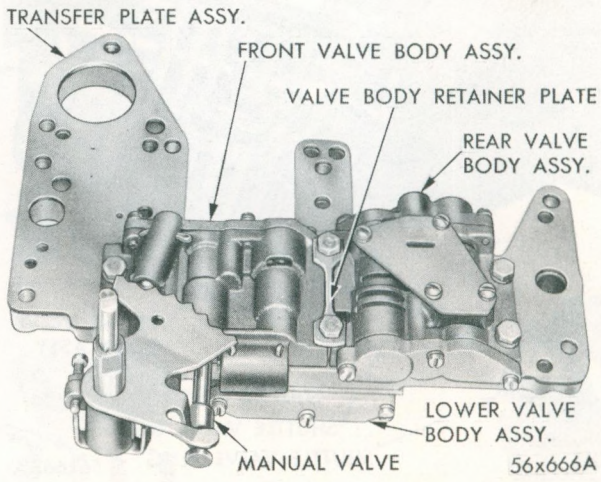


Fig. 146—Valve Bodies and Transfer Plate Assembly (Bottom View)

144. FRONT VALVE BODY—INSTALLATION

Position front valve body on steel plate (upper), as shown in Figure 136, and install two bolts and lockwashers in outer end of valve and draw down finger tight.

145. REAR VALVE BODY—INSTALLATION

Invert transfer plate assembly and replace on fixture, Tool C-3528. With servo pressure bleed valve in place, hold rear valve body up into position against steel plate, as shown in Figure 135, and install the two outer bolts (short) with lockwashers through the transfer plate and into lower valve body. Draw up finger tight.

146. LOWER VALVE BODY—INSTALLATION

To prevent loss of governor compensator valve retainer pin, position steel plate (lower) on lower valve body. Place valve body and steel plate into position on transfer plate. Install the two bolts (intermediate length) and lockwashers, and as shown in Figure 133, tighten the two lower valve body and two rear valve body bolts to 60 inch-pounds torque.

Invert valve bodies and transfer plate and replace on fixture Tool C-3528. Install valve bodies retainer plate and two bolts (long) with lockwashers, (Fig. 144), and tighten the two retainer plate bolts and two front valve body bolts to 60 inch-pounds torque, as shown in Figure 145. **Overtightening will cause distortion to valve body and result in sticky valves.** Check manual valve operation to make sure it operates freely, as shown in Figure 146. Place transfer plate and valve bodies assembly in transmission case. Remove stand, Tool C-3280. Install transmission as outlined under "Removal and Installation of Transmission," Paragraph 45.

TORQUE CONVERTER SERVICE PROCEDURES

147. REMOVAL AND INSTALLATION OF TORQUE CONVERTER

a. Removal

Remove transmission. Remove the torque converter housing to adapter screws and lockwashers. Remove torque converter housing. If torque converter is being removed because of excessive runout damage, check runout by using a dial indicator on hub and mark the highest point of runout on both converter and crankshaft flange. The reason for this is so it may be determined later if runout was caused by the converter or crankshaft, after crankshaft has been checked in same manner.

Using wrench, Tool C-589 or C-811, remove eight torque converter stud nuts and lockwashers from crankshaft flange, as shown in Figure 147. Remove torque converter from crankshaft. Check crankshaft flange runout (maximum .002 inch).

b. Correcting Hub Runout

Permissible torque converter hub runout, when mounted on crankshaft, is .004 inch total indicator reading. The following method is provided for bringing the converter hub within this tolerance: If new torque converter is being installed, make sure all visible foreign matter such as raised metal around studs, burrs, chips, etc., have been removed from converter and crankshaft drive flanges.

Check crankshaft flange runout (maximum .002 inch T.I.R.). Check torque converter runout by mounting a dial indicator to adapter plate or some other unit which is mounted rigidly to cylinder block, as shown in Figure 148. Rotate the converter 360 degrees and deter-

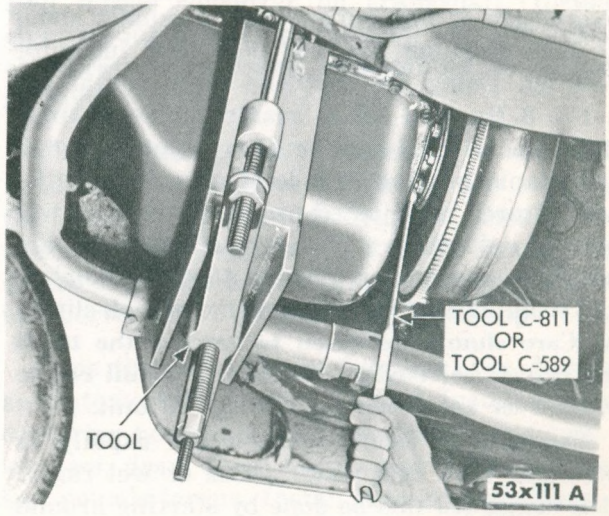


Fig. 147—Removing or Installing Torque Converter Mounting Stud Nuts

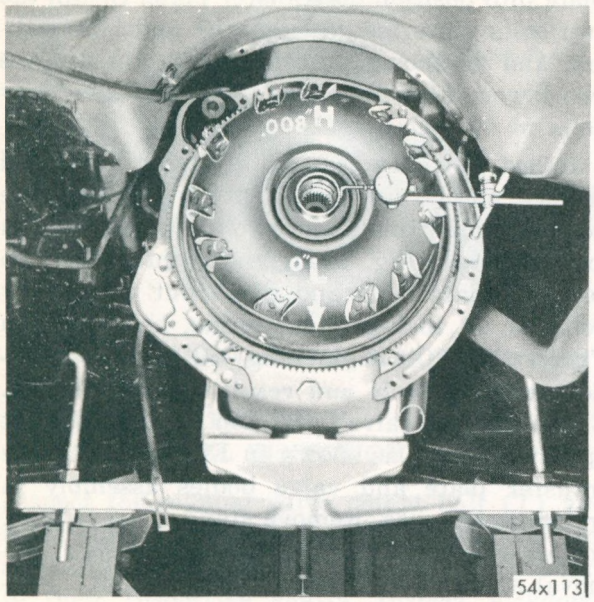


Fig. 148—Checking Torque Converter Runout

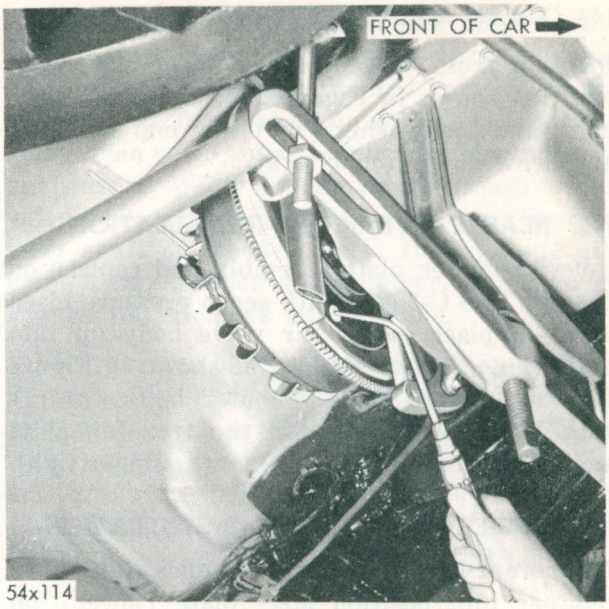


Fig. 149—Correcting Torque Converter with Heat

mine the converter hub O.D. runout. If this exceeds .004 inch total indicator reading, correct by using heat in following manner: Before using heat, make definitely sure the torque converter has been drained.

Mark position of hub low spot as accurately as possible on impeller shell. Rotate the converter so this mark is directly down. Remove dust shield from front of adapter plate. Using chalk, mark front cover radius directly opposite hub low spot previously marked on impeller shell. The subsequent heating operation can now be done through opening in adapter plate, as shown in Figure 149.

The size of spot to be heated is governed by magnitude of hub runout and is usually about ½ inch diameter for .008 inch total indicator reading. Using an acetylene torch containing a No. 3 tip, and set to maximum heat, apply it to the selected spot until it becomes a dull red. Rapid heating of a local area is essential and if torch is adjusted properly, the spot will become red within a few seconds. If sparks are noted, it is an indication that torch is too close and metal is starting to burn; move back slightly. **Care should be taken to remove the torch the instant selected spot becomes a dull red to avoid over correction or damage to unit.**

The area is then quenched (as rapidly as possible) with cold water (hose or wet rags). It is suggested this be done by starting around the heated area and working in toward the spot. This prevents the heat from spreading. The hub runout should not be rechecked until converter has returned to a uniform room temperature. If converter hub runout exceeds .016 inch total indicator reading, remove converter and recheck drive flanges for raised metal chips, etc. Check crankshaft flange runout (maximum .002 inch). If hub runout remains in excess of .016 inch total indicator reading, install a new converter.

148. REPLACING STARTER RING GEAR ON TORQUE CONVERTER

a. Removal

Support the torque converter assembly in a vise and with a file carefully remove the staking lugs which retain the ring gear to torque

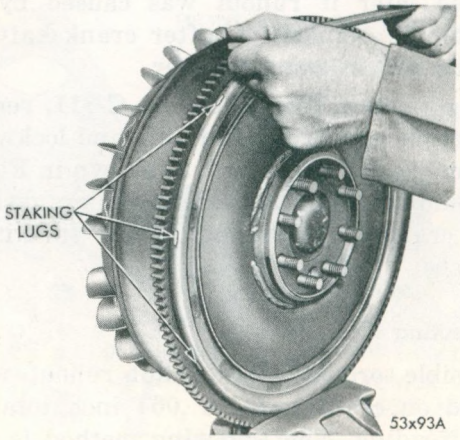


Fig. 150—Removal of Staking Lugs from Torque Converter

converter, as shown in Figure 150. Be careful to avoid distortion when supporting torque converter in vise.

Place torque converter on blocks of wood (for support) while removing gear. Using a blunt chisel, or drift, tap around ring gear until it comes off torque converter, (Fig. 151).

b. Installation

Remove burrs or raised spots (left on the gear contact surface of torque converter) with a file. Do not remove more metal from converter than is required to remove burrs and rough surfaces. Any of the following methods may be used to heat the starter ring gear for installation on converter:

Oven—Use Oven C-794 and set temperature at 150 degrees F. Allow ring gear to remain in oven for approximately 15 to 20 minutes.

Boiling Water—Place ring gear in a shallow container, add water, and heat for approximately eight minutes after water has come to a boil.

Steam—Place ring gear on a flat surface and direct the steam flow around the gear for approximately two minutes.

Flame—Place ring gear squarely on a flat surface. Using a medium-size tip, direct a slow flame around the inner rim of the gear, being careful not to direct the flame onto teeth of ring gear. Place a few drops of water on face of gear at intervals during heating process. When gear is hot enough to boil drop of water, installation of gear to torque converter can be made.

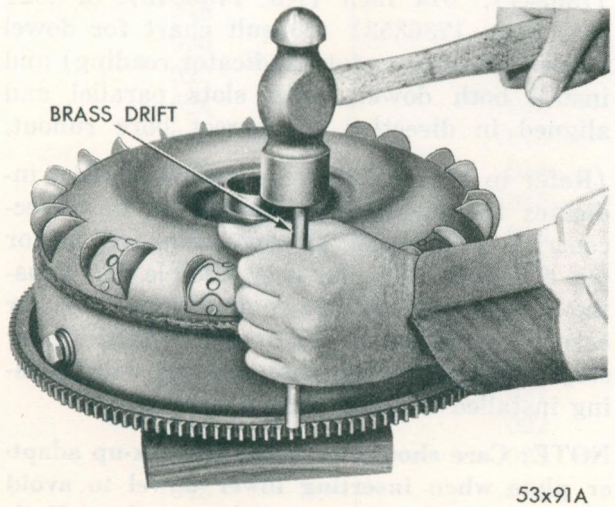


Fig. 151—Removing Starter Ring Gear

Place starter gear over flange surface of torque converter, making sure that the rear face of gear contacts flange on torque converter evenly around the entire diameter. Reweld ring gear to torque converter, using extreme care to place as nearly as possible, the same amount of metal in exactly the same location as original assembly. This is necessary in order to maintain proper balance of unit. Place welds alternately on opposite sides of the converter to minimize distortion.

The following suggestions are offered as an aid in making the weld:

a. Use a welding current of 200 amps.

b. Use a D.C. welder that is set straight polarity or an A.C. welder.

c. Use a $\frac{5}{32}$ inch diameter, No. 47 or a $\frac{5}{32}$ inch diameter No. W2B (or their equivalent). To prevent burning through the torque converter, the arc should be directed at the intersection of gear and housing from an angle of approximately 45 degrees from face of gear. **DO NOT GAS WELD.**

Before installing the torque converter, inspect all gear teeth and remove all nicks where metal is raised, welding splatter, etc., as these will cause noisy starter operation.

149. INSTALLATION OF TORQUE CONVERTER

Inspect mating surfaces on torque converter and crankshaft flange for burrs and dirt. Install torque converter on crankshaft. Install eight torque converter stud nuts and lockwashers. Draw down evenly and tighten, as shown in Figure 147.

When torque converter assembly is removed from crankshaft drive flange for any reason, the converter assembly runout should be checked when reinstalled. Runout should not exceed .004 inch total indicator reading. Refer to "Correcting Hub Runout," Paragraph 147.

Place torque converter housing over dowels and into position against adapter. Install torque converter housing to adapter screws and lockwashers, draw down evenly and tighten to 30 foot-pounds torque. Install transmission if converter housing bore and face runout are within limits.

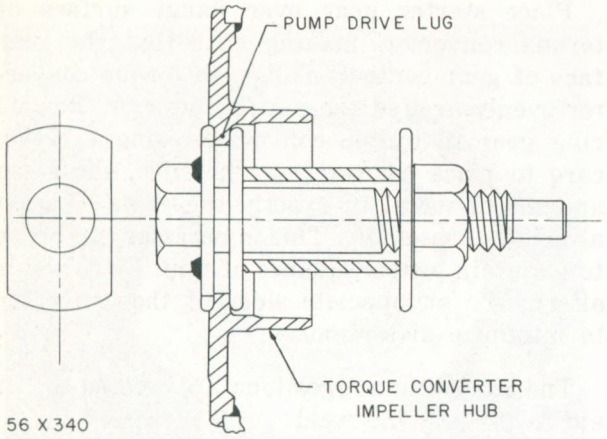


Fig. 152—Tool C-3461 Installed in Torque Converter Hub

150. CORRECTING TORQUE CONVERTER HOUSING BORE AND FACE RUNOUT

a. Torque Converter Housing Bore Runout

Mount Tool C-3461, as shown in Figure 152, inside converter with ears of washer behind converter pump drive lugs. The square end of bolt can be held with a wrench as nut is tightened. Dial indicator set, Tool C-3339 can now be attached to square end of bolt, as shown in Figure 153.

Locate indicator so that it is bearing on transmission pilot bore of converter housing and rotate the converter as outlined previously.

If bore runout exceeds .010 total indicator reading, the following procedures illustrate a correction made possible by selecting a pair (same part number) of following three dowels.

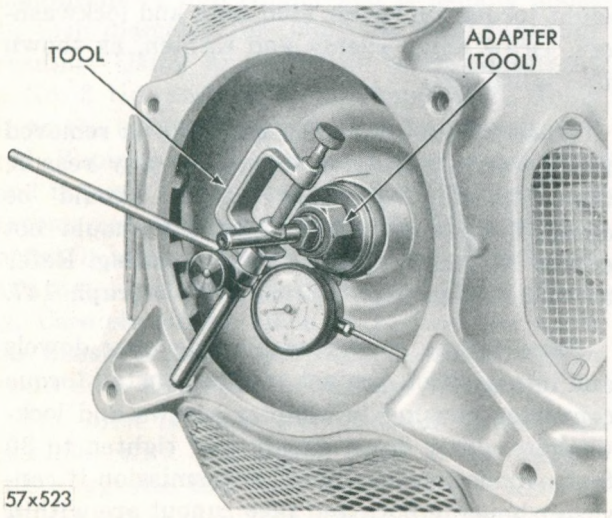


Fig. 153—Gauge Installed for Indicating Bore Runout

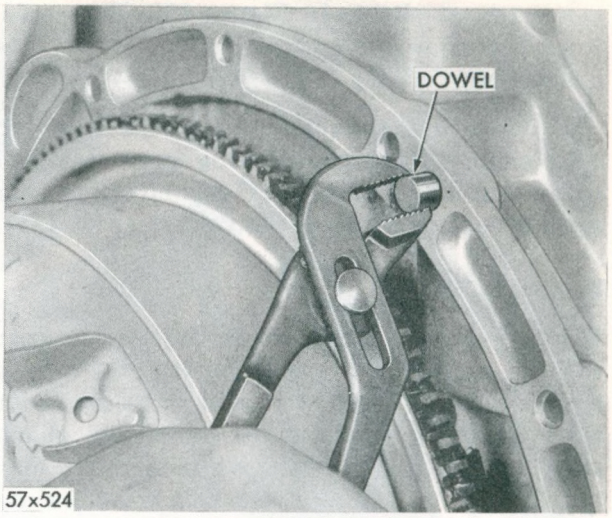


Fig. 154—Removing Dowel

Part No.	Eccentricity
1736347	.007″
1736348	.014″
1736353	.021″

Determine amount and direction of bore runout. Loosen intake manifold bolt which holds throttle linkage bracket in position. Before proceeding further, it is essential that the torque converter impeller hub runout be within .004 inch total indicator reading. Correct if necessary.

Remove two dowel pins from adapter plate that align housing. Removal can be made with "vise-grips" and prying with screw driver or using "special" pliers, as shown in Figure 154.

Select eccentric dowels (pair) .007 inch (No. 1736347), .014 inch (No. 1736348), or .021 inch (No. 1736353) (consult chart for dowel to use in relation to total indicator reading) and install both dowels with slots parallel and aligned in direction to correct bore runout.

(Refer to Figure 155 for examples). (Slot indicates the direction of maximum dowel eccentricity). Majority of corrections will be for one direction only; but it is possible that housing bore may be out in two directions. In latter case, it may be necessary to use the next higher step dowel, adjusting these dowels with housing installed to bring within tolerance.

NOTE: Care should be taken to back-up adapter plate when inserting lower dowel to avoid distortion or breakage or adapter plate. Both

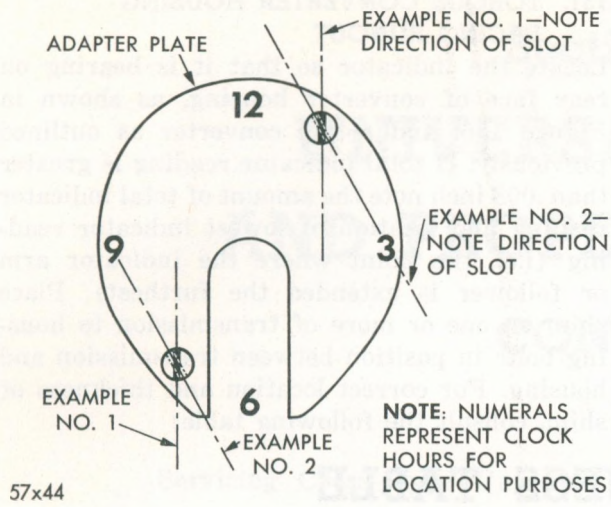


Fig. 155—Orientation Diagram—Positioning Eccentric Dowels

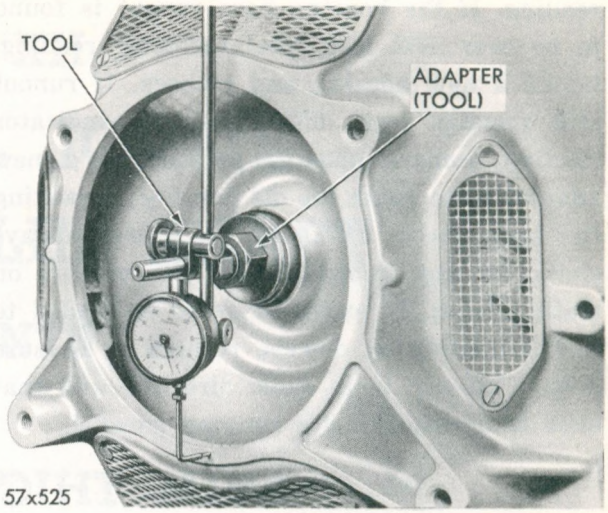


Fig. 156—Gauge Installed for Indicating Face Runout

dowels should be inserted into adapter plate up to off-set shoulder.

b. Example No. 1

Housing Bore in relation to crankshaft centerline is high .010 inch for total indicator reading of .020 inch. Readings are as follows: 12 o'clock—0 inch, 3 o' clock—.005 inch, 6 o'clock —.030 inch, 9 o'clock—.020 inch. Vertical and horizontal adjustment is necessary. Dowels should be inserted into adapter plate on an angle corresponding to direction of housing bore centerline and crankshaft centerline. Use extreme care in selecting the dowel to be used to correct runout in two directions.

Install housing making sure mating faces are clean and free from dirt and nicks. Tighten bolts. Check bore concentricity; if necessary, loosen bolts and adjust alignment of dowels to give a reading within .010 inch total indicator

ECCENTRIC DOWEL CHART

Total Indicator Reading	Amount Off Center	Dowel To Be Used	Part No.
.012	.006	.007	1736347
.014	.007	.007	"
.016	.008	.007	"
.018	.009	.007	"
.020	.010	.007	1736348
.022	.011	.014	"
.024	.012	.014	"
.026	.013	.014	"
.028	.014	.014	"
.030	.015	.014	"
.032	.016	.014	"
.034	.017	.014	"
.036	.018	.021	1736353
.038	.019	.021	"
.040	.020	.021	"
.042	.021	.021	"
.044	.022	.021	"
.046	.023	.021	"
.048	.024	.021	"
.050	.025	.021	"
.052	.026	.021	"

reading. If the housing bore runout is found to be over .052 inch total indicator reading, install a new housing and recheck. If runout still remains over .052 inch total indicator reading, remove housing and install a new adapter plate (with the old housing) repeating the bore check. In these procedures always check for any imbedded particles or dirt on mating faces. If excessive force is needed to install housing on dowels, recheck to be sure dowel "off-set" is in same direction and that slots in dowel ends are running parallel.

151. TORQUE CONVERTER HOUSING FACING RUNOUT

Locate the indicator so that it is bearing on rear face of converter housing, as shown in Figure 156, and rotate converter as outlined previously. If total indicator reading is greater than .008 inch note the amount of total indicator reading and location of lowest indicator reading (i.e., the point where the indicator arm or follower is extended the furthest). Place shim on one or more of transmission to housing bolts in position between transmission and housing. For correct location and thickness of shim, consult the following table:

SHIM THICKNESS TABLE

Location of Housing Face Low Point	Location of Shim	Total Indicator Reading Observed on Housing Face	Total Shim Thickness
Near one of the lower trans. to housing bolt holes.	Place shim on bolt which will enter this hole.	1) .005 to .010″ 2) .010 to .015″ 3) .015 to .020″	1) .013″ 2) .020″ 3) .026″
Near one of the upper trans. to housing bolt holes.	Place shim on bolt which will enter this hole.	1) .005 to .010″ 2) .010 to .015″ 3) .015 to .020″	1) .014″ 2) .021″ 3) .029″
Between the two lower trans. to housing bolt holes.	Place shims on both bolts which will enter these holes.	1) .005 to .010″ 2) .010 to .015″ 3) .015 to .020″	1) .010″ 2) .015″ 3) .020″
Between the two upper trans. to housing bolt holes.	Place shims on both bolts which will enter these holes.	1) .005 to .010″ 2) .010 to .015″ 3) .015 to .020″	1) .003″ 2) .012″ 3) .016″
Between the upper and lower trans. to housing bolt holes.	Place shims on both bolts which will enter these holes.	1) .005 to .010″ 2) .010 to .015″ 3) .015 to .020″	1) upper .010″ lower .014″ 2) upper .015″ lower .020″ 3) upper .020″ lower .027″

Part Number	Thickness
1610442	.002″
1610443	.003″
1610444	.005″

The above shims, when used in combination, will satisfy any of the required shim thickness listed in the table. **Before reinstalling transmission, check for any transmission leakage or damaged parts (seals and bushings). In most cases, the torque converter hub oil seal should be replaced. Install transmission and throttle bracket.**

Section XII

UNIVERSAL JOINTS AND PROPELLER SHAFT

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DATA AND SPECIFICATIONS

Models	C-75	C-76	IM-1, 2 and 4	Town & Country C-75	Town & Country C-76
Propeller Shaft Number Used	1	1	2	1	1
Diameter					
With Standard Transmission	3.5 in.	—	—	3.5 in.	—
With TorqueFlite Transmission	3.0 in.	3.0 in.	2.75 in.	3.25 in.	3.25 in.
Diameter with Air Conditioning					
And Standard Transmission	—	—	—	3.5 in.	3.50 in.
And TorqueFlite Transmission	3.25 in.	3.25 in.	2.75 in.	3.25 in.	3.25 in.
Length Centerline to Centerline of "U" Joints					
With Standard Transmission	59.02	—	—	59.02	—
With TorqueFlite Transmission	58.96	58.96	63.64	58.96	58.96

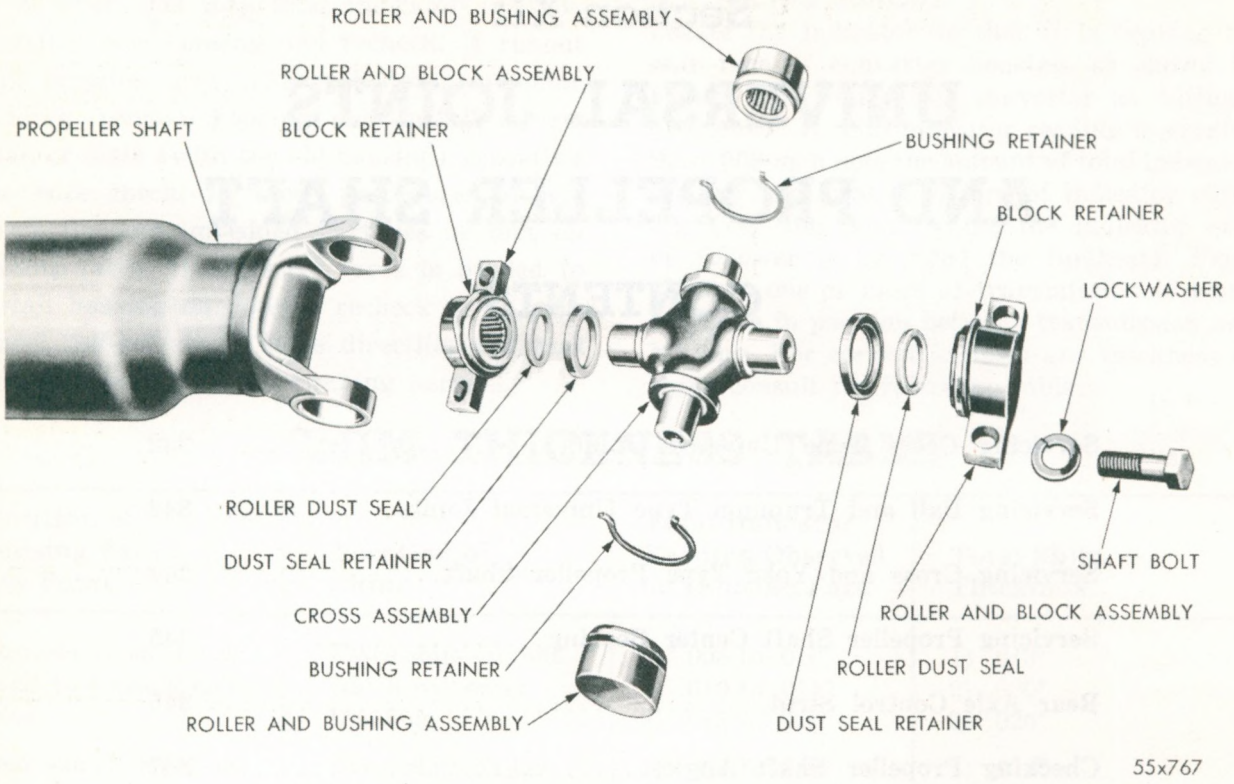

Fig. 1—Rear Universal Joint—Cross Type (Disassembled View)

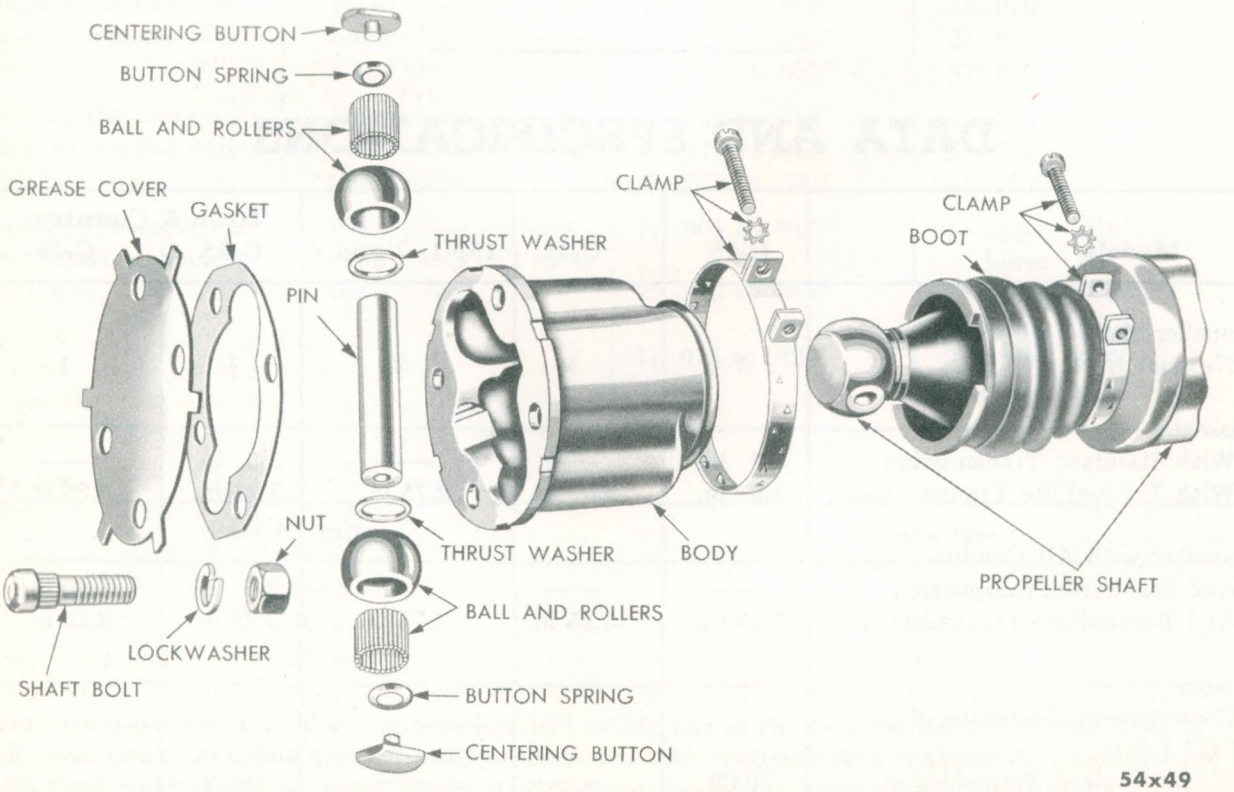

Fig. 2—Front Universal Joint—Ball and Trunnion Type (Disassembled View)

DATA AND SPECIFICATIONS (Cont'd)

Models	C-75	C-76	IM-1, 2 & 4	Town & Country C-75	Town & Country C-76
Flange to Flange Length					
With Standard Transmission	61.16	—	—	61.16	—
With TorqueFlite Transmission	61.10	61.10	64.14	61.10	61.10
Lubrication			*PRE-PACK		
Universal Joints Type	(Front) Ball and Trunnion (Rear) Cross Type		Cross Type (Only)	(Front) Ball and Trunnion (Rear) Cross Type	
Bearing Type	ANTI-FRICTION				

*Every 20,000 miles.

**Package 59.41.

SECTION XII

UNIVERSAL JOINTS AND PROPELLER SHAFT

UNIVERSAL JOINTS

Two types of Universal Joints are used on 1957 Chrysler Models and are as follows: The Cross Type, as shown in Figure 1, and Ball and Trunnion Type, as shown in Figure 2.

The ball head of the Ball and Trunnion Type, is an integral part of the tubular propeller shaft and is covered by the joint body. The pin, with balls, needle bearings, thrust washers, centering button, and button spring at each end, extends through the propeller shaft ball head and rides in ball channels in the body of the joint assembly. This balanced installation is designed to absorb thrust and torque of the drive line. This type of joint is used in Models C-75, C-76 at front universal joint.

The Cross Type universal joint is used at rear joint of all models, and front and center bearing joints of Imperial Models are equipped with center bearing and two propeller shafts.

No adjustments are provided to compensate for wear in universal joint assembly. Parts that show excessive wear must be replaced.

CAUTION

When disassembling universal joints, keep parts identified as to original position. Failure to assemble parts in their original positions may cause an unbalanced condition in the propeller shaft. Retorque mounting nuts after the initial 1,000 miles of operation.

CROSS TYPE

1. SERVICING CROSS TYPE UNIVERSAL JOINTS (Fig. 1)

Remove propeller shaft from the vehicle. Remove two bushing retainers holding bushings in shaft yoke and remove bushings. Tilt cross so that it may be removed from propeller shaft yoke. Straighten out end of retainer lock and remove two roller and block assemblies. Remove dust seals and retainers. Inspect parts and replace parts that show wear. Lubricate roller and bushings with universal joint grease (extreme pressure) and assemble joint in reverse order of disassembly.

BALL AND TRUNNION TYPE

2. SERVICING BALL AND TRUNNION TYPE UNIVERSAL JOINTS

To disassemble universal joint for repair or inspection of all component parts, refer to Fig. 2 and proceed as follows: Remove joint body metal cover and gasket by bending tabs of cover away from body; remove cover and gasket. Slide body down on propeller shaft exposing two centering buttons. Remove centering buttons and spring washers from ends of trunnion pins. Slide two balls, rollers, and thrust washers off trunnion pin. Wash all parts with solvent and blow dry with compressed air. Inspect and replace worn parts.

NOTE: Reconditioning of ball and trunnion type universal joints will only be necessary when excessive backlash exists between balls and trunnion. In some instances, it will be found that universal joint body has worn, and it will be necessary to replace all parts, including body pin, thrust washers, and centering buttons. Worn rollers should also be replaced.

3. UNIVERSAL JOINT MAINTENANCE (BALL AND TRUNNION)

The universal joints, propeller shaft, and hand brake drum are accurately balanced during process of manufacture. Care should be exercised to maintain this condition of balance by close adherence to the following: Do not use more than 2½ ounces of lubricant in a universal joint (ball and trunnion type) of the C-76 and 2 ounces in the C-75 at any time. Keep propeller shaft, hand brake drum, flanges, etc. free from undercoating, dirt and ice.

CAUTION

When installing trunnion pin in propeller shaft care should be taken to see that trunnion pin is centered in shaft. Each end of pin should protrude the same distance, with variation of no more than .003 inch. If one side of pin extends more than .003 inch farther than the other, propeller shaft will be out of balance. Tool C-3534 (C-75 models), Tool C-3211 on the C-76, as shown in Figure 3, will facilitate removal, installation, and centering of trunnion pin.

Failure to observe these recommendations may result in an out-of-balance condition causing vibration.

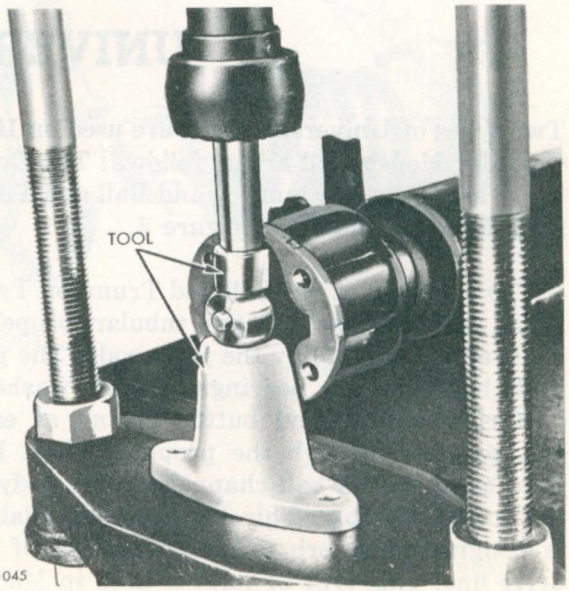

Fig. 3—Installing Joint Pin

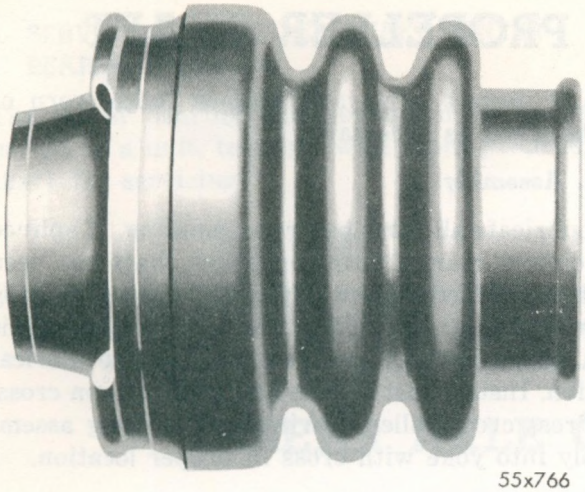

Fig. 4—External Type Dust Cover

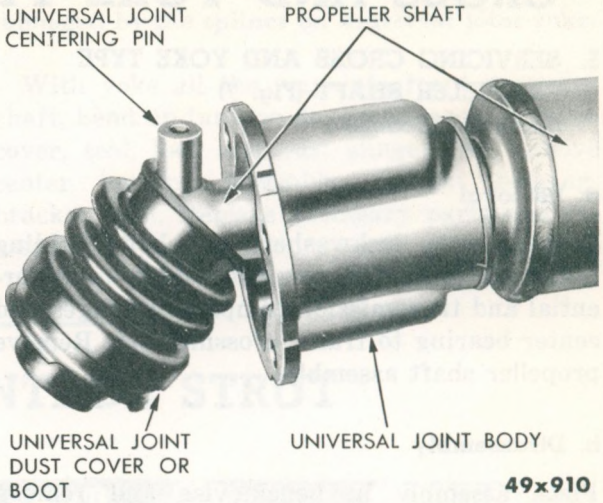

Fig. 5—Sliding Cover Over Ball Head and Fin

4. SERVICING EXTERNAL TYPE UNIVERSAL JOINT DUST COVER

To replace an external type universal joint dust cover (Fig. 4) that is damaged, remove propeller shaft assembly from car and clamp lightly in vise. One end of shaft should be resting on bench in a horizontal position, disassemble joint, removing all parts except body and pin. Clean body, ball head, and pin thoroughly.

A complete coating of grease (or suitable rubber lubricant) must be smeared on outside and inside of dust cover, entire surface of ball head, pin, and inside of body. **(It is very important that this instruction be followed.)** Stretch grease-soaked boot or dust cover over pin and ball head, as shown in Figure 5. Work dust cover into body as far as possible.

CAUTION

USE NO TOOLS FOR THIS OPERATION.

With body in position so pin can enter ball channels, pull body sharply over pin, thereby forcing dust cover into body. With one hand, grip end of dust cover, protruding through back end of body. With other hand, pump body back and forth, as shown in Figure 6, until entire dust cover has passed through body. During operation cone may have reversed itself inside dust cover. Pull it out to its normal position.

Insert 2½ ounces of heavy fiber, universal joint grease in joint of C-76 (2 ounces in the C-75) and assemble balls to pin. Install cover.

Install shaft, using new lockwashers. Be sure to double check flange bolts for tightness, to insure against grease leakage. Recheck after 1,000 miles of operation.

CAUTION

Never attempt to use a needle-like arrangement for forcing lubricant into boot (or dust cover) on universal joints. Excessive grease can be forced into boot and cause shaft to be thrown out of balance, burst boot, or lubricant can be lost through injection hole during high speed operation. The joints must be disassembled and packed with universal joint grease.

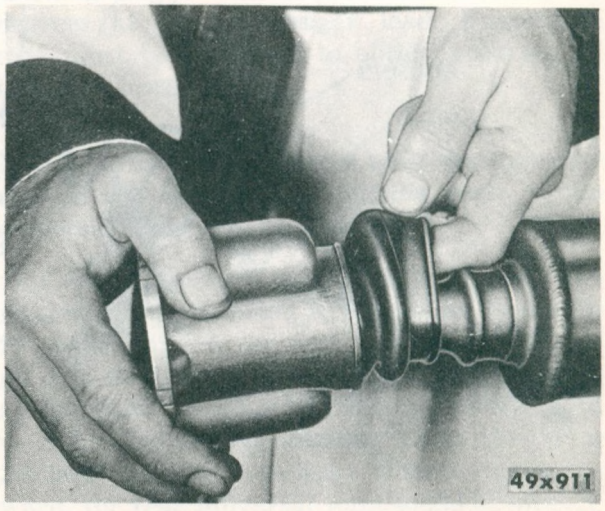

Fig. 6—Working Dust Cover Through Body

CROSS AND YOKE TYPE PROPELLER SHAFT

5. SERVICING CROSS AND YOKE TYPE PROPELLER SHAFT (Fig. 7) (Imperial Models)

a. Removal

Remove nuts, lockwashers and bolts holding universal joint and propeller shaft to differential and transmission companion flanges and center bearing to frame crossmember. Remove propeller shaft assembly.

b. Disassembly

Place assembly in bench vise and remove splined yoke cross bushing retainers. Press out bushings and remove cross from yoke. Remove bearing blocks, dust seals, and dust seal retainers. Remove retainers from cross roller bearings. Press out bearings and cross. Remove dust seals and retainers from cross. The cross roller bearing block and its component parts, also form an assembly. These parts are **not** serviced separately. After disassembly, clean and inspect parts and replace those worn or damaged as necessary.

c. Assembly

Lubricate all parts before assembling. If splined joint at rear of front propeller shaft has been disassembled, fill cavity with one ounce (by weight) of MS 1124. The center bearing is a sealed bearing and does not require lubrication. Install dust shields and retainers on cross. Press cross roller bearing and bushing assembly into yoke with cross in proper location.

CAUTION

Make certain that all of roller bearings are correctly placed in roller bushing. Also, be sure balance arrows are in alignment (Fig. 7).

d. Installation

Place propeller shaft in its correct position under car. Make certain that slip-spline end of shaft is located toward front of car. Insert attaching screws and tighten securely.

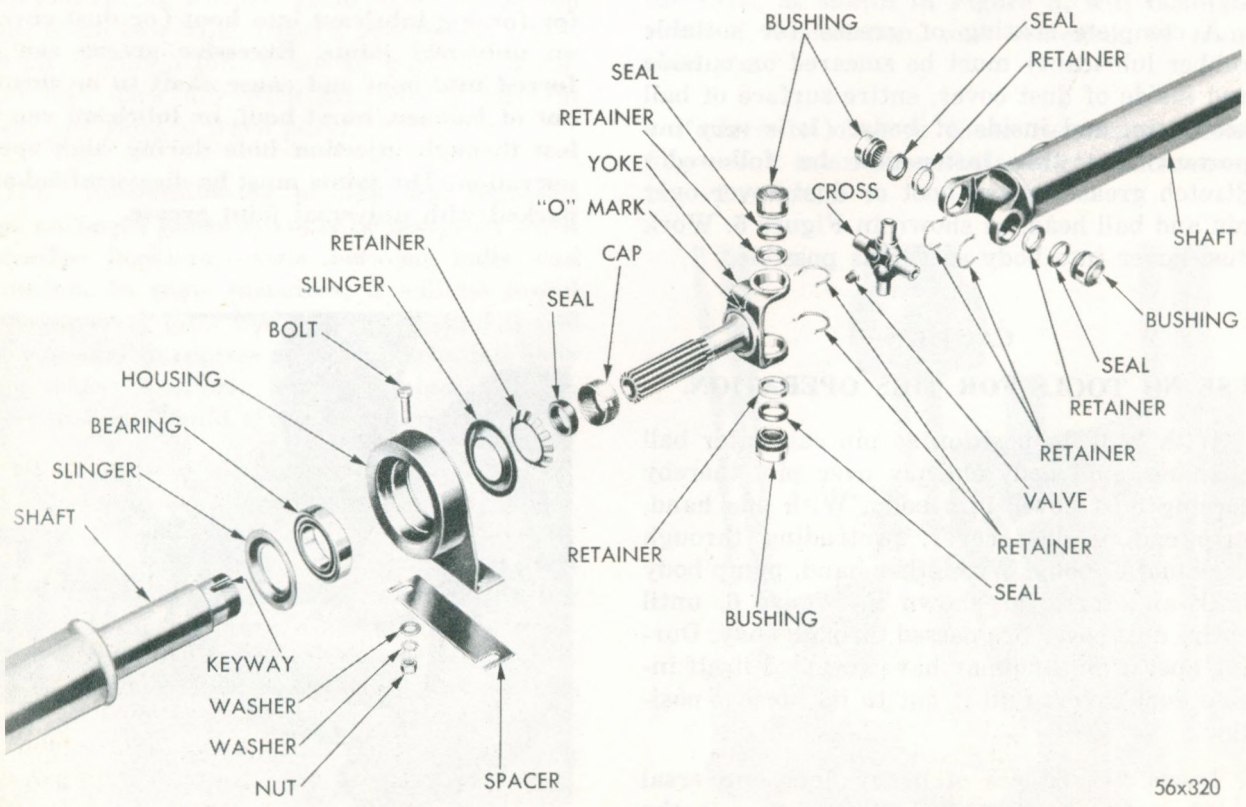

Fig. 7—Propeller Shaft and Center Bearing Assembly (Disassembled View)

6. SERVICING PROPELLER SHAFT CENTER BEARING (Figure 7)

The center bearing and housing must be removed as a unit, together with front propeller shaft, for servicing.

CAUTION

Do not extend two piece center bearing propeller shaft to its full length. The seal may be damaged by the splines on universal joint yoke.

With yoke all the way into front propeller shaft, bend up tang on dust seal cover. Remove cover, seal, lock and dust slinger and remove center bearing assembly. Inspect bearing, bracket, seal. Replace necessary parts and reassemble.

REAR AXLE CONTROL STRUT

The 1957 Imperials are designed with two propeller shafts and a propeller shaft center bearing, as shown in Fig. 8. Conditions may arise under certain passenger loads which may create a propeller shaft shudder or vibration at speeds of 15 to 20 miles per hour.

In order to control this shudder or vibration, a rear axle control strut, as shown in Figure 9, has been incorporated in rear axle design for purpose of controlling rise of nose of rear axle carrier under varying load conditions. Corrections of propeller shaft shudder should be made as follows: Before diagnosing a shudder condition make sure engine has been tuned and is operating smoothly with no hesitation or stumble on accelerator.

NOTE: A rough engine can aggravate or produce a shudder.

With fuel tank approximately half full, determine under what speed and passenger load a shudder is present and if shudder is light, moderate or heavy. Check the indexing of universal joints and propeller shaft assembly, as shown in Figure 7. The letter "O" on front face of spline should be lined up with key slot at rear of front shaft.

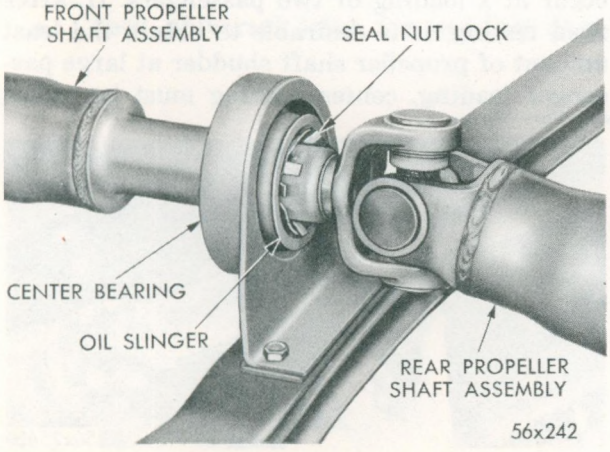

Fig. 8—Center Bearing Installed

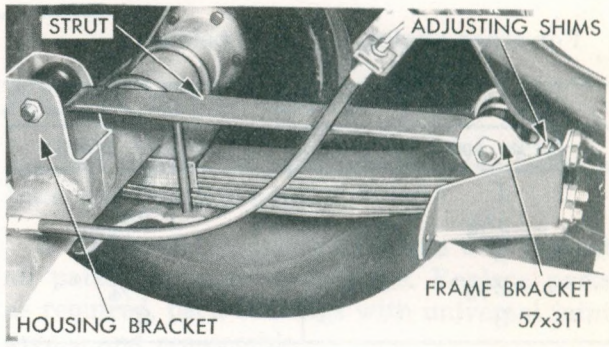

Fig. 9—Rear Axle Control Strut

Place car on platform with weight of vehicle on rear wheels. Measure rear universal joint working angle. This angle should be 1 to 3 degrees at zero passenger load. Reasonable care must be exercised to obtain accuracy of this measurement.

NOTE: If car is located on a hoist that supports rear of car on axle housing, the angle of the universal joints will be influenced.

If measured angle is not 1 to 3 degrees, correction should be made by shimming axle with 2° taper shim. After rear universal joint angle has been adjusted as near to two degrees as possible, measure middle universal joint working angle. This working angle should be 2½ degrees (more or less) with the apex upward, for rear universal joint angle of two degrees at zero passenger load.

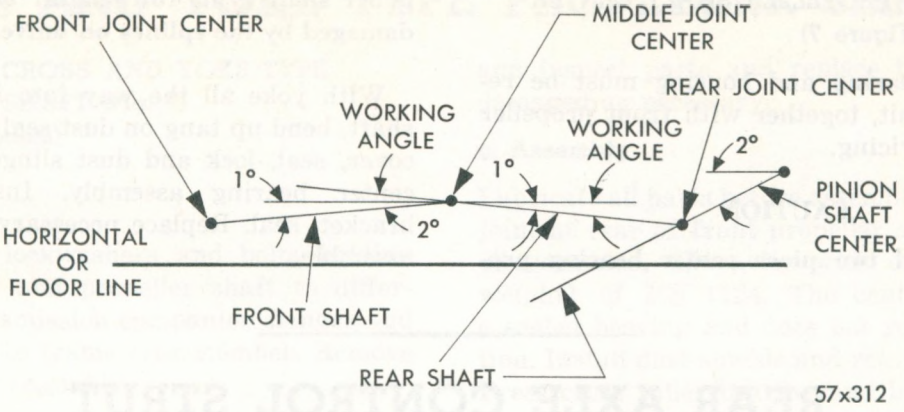

Fig. 10—Determining Working Angles—Front and Rear Propeller Shaft

For other angles, see table below:

TABLE

Rear Joint	Middle Joint
1	3
1½	2¾
2	2½
2½	2¼
3	2

The middle universal joint angle is adjusted by adding or removing shims between center bearing insulator and crossmember. Adding ⅛ inch shim will increase middle universal joint angle about ½ degree; likewise, removing ⅛ inch shim will reduce angle about ½ degree.

In measuring the angles of front and rear propeller shafts and the pinion shaft, a spirit level protractor must be used to determine amount the shafts are below horizontal (or the end of the shaft is pointing down.) Determine working angles, as shown in Figure 10.

Since adjacent shafts are pointing in different directions (up or down) when viewed in same direction (from front to rear of car) the working angles are obtained by adding the angles below horizontal. Therefore, the middle joint working angle as shown in Figure 10, is 2° and the rear joint working angle is 3°. If the adjacent shafts were pointing in the same direction then the angles below horizontal would be subtracted to obtain the joint working angle.

If large number of shims must be added or removed at center bearing, rear universal joint angle should be rechecked to be assured that it has not been appreciably altered from two degrees.

When these adjustments have been made, the least amount of propeller shaft shudder should occur at a loading of two passengers. If, after road testing, it is desirable to obtain the least amount of propeller shaft shudder at large passenger loading, center bearing must be raised

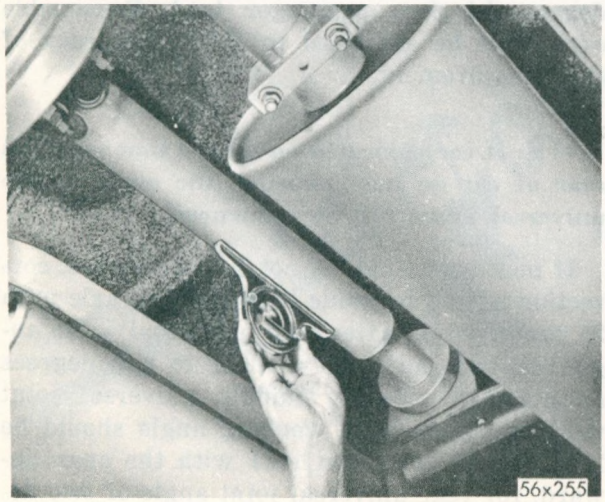

Fig. 11—Checking Front Propeller Shaft Angles

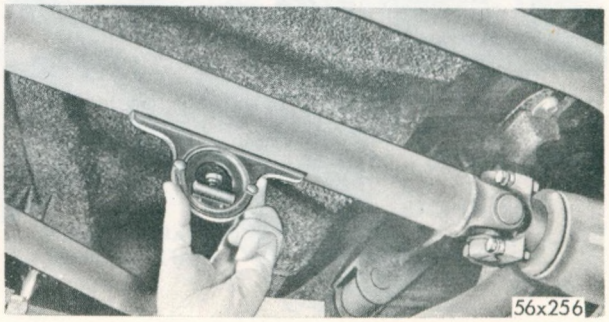

Fig. 12—Checking Rear Propeller Shaft Angles

slightly by means of shimming. Lowering center bearing will move point of least shudder to a lower passenger loading.

7. CHECKING PROPELLER SHAFT ANGLES

Locate car over pit with wheels supporting car. Check universal joint angles with a spirit level protractor, as shown in Figures 11 and 12. Measure angles of front propeller shaft, middle propeller shaft, and rear axle pinion drive shaft flange.

The rear axle drive pinion shaft flange angle should be obtained by removal of rear end of rear propeller shaft, and measuring angle of front face of companion flange, as shown in Figure 13.

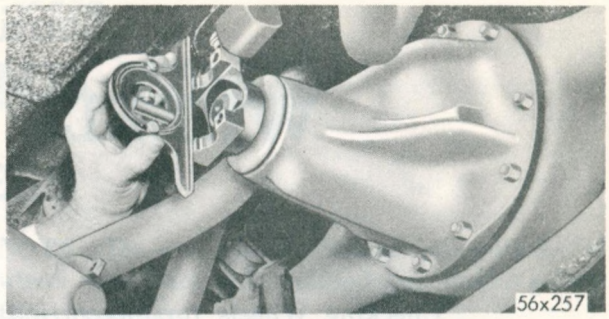

Fig. 13—Checking Companion Flange Angle

SERVICE DIAGNOSIS

8. PROPELLER SHAFT VIBRATES

a. If propeller shaft, drum, and flange are not shielded while car is being undercoated, the undercoating material may accumulate on underside of propeller shaft and cause vibration. To remedy such a condition, inspect shaft and remove undercoating material (if present) with solvent.

b. Check transmission flange nuts and rear axle differential flange nuts for looseness. Tighten to Data and Specifications.

c. Check alignment of balance arrows on both shaft and front universal joint. These arrows must be exactly in line. If not, reposition splines so that arrows are properly aligned.

9. UNIVERSAL JOINTS NOISY

a. Check universal joint for possible damage and tighten propeller shaft flange bolts to Data and Specifications.

b. Disassemble universal joints and inspect all parts for wear or damage. Replace parts as required, pack bearings with universal joint grease and reassemble.

c. Inspect universal joint bearings for wear and replace as necessary.

d. Check for flange runout. In many instances, it is possible to correct a flange runout condition by repositioning universal joint 180 degrees with companion flange. Reposition only one universal joint at a time and road test car after each repositioning operation.

e. Check splines. If excessively loose, inspect splines on shaft or in flange for wear or damage. Replace shaft or flange, as necessary, to correct condition.

Section XIII

WHEELS AND TIRES

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DATA AND SPECIFICATIONS

Models	C-75	C-76	IM-1-2-4
WHEELS			
Type		Steel Disc	
Rim		Drop Center—Safety Wheel	
Size	14 x 6 in.	14 x 6½ in.	14 x 7 in.
Flange Type	K	K	L
No. of Nuts to Attach Wheel	5	5	5
Stud Hole Circle (diameter)	4½	4½	5½
Stud Size	½–20	½–20	9/16–18
TIRES			
Type	Super Soft Cushion Tubeless	Nylon Super Soft Cushion Tubeless	
Size	8.50 x 14	9.00 x 14	9.50 x 14
Cord Material	Rayon	Nylon	Nylon
TIRE PRESSURE			
Pounds—Cold	22	22	22

Section XIII
WHEELS AND TIRES

WHEELS

1. SAFETY-RIM WHEELS

Safety-rim wheels, as shown in Figure 1, "A" are designed to provide added protection in case a blow-out or rapid deflation of tire occurs. The raised rim section as shown in Figure 1, "A" tends to hold tire in place.

2. TIGHTENING WHEEL HUB NUTS

Tighten wheel hub nuts evenly while tire is off ground. Lower tire to ground to tighten nuts securely. **Make sure these nuts are tight.**

3. CHECKING WHEELS FOR ECCENTRICITY

Dismount tire and test with wheel mounted on brake drum. Position dial indicator on firm surface to prevent deflection. With the anvil of indicator bearing on the inner tire bead surface of wheel, as shown in Figure 2, slowly rotate wheel and note the total runout. Mark high and low spots and the amount on wheel. If radial runout of wheel exceeds .045 inch, replace the wheel.

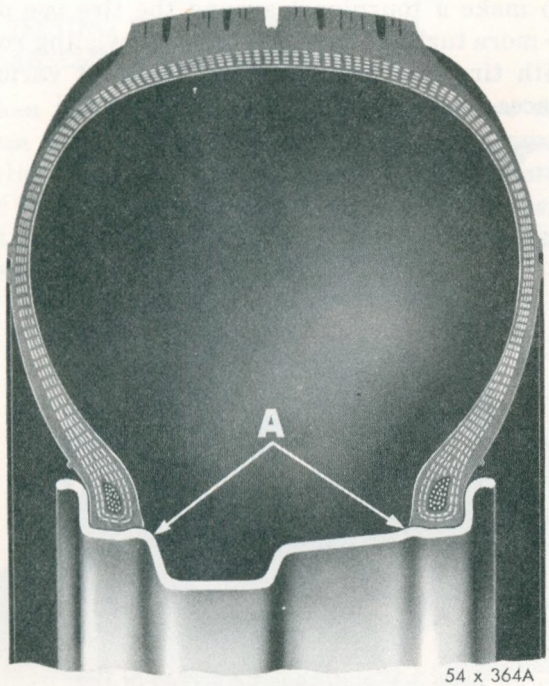

Fig. 1—Safety Type Rim

NOTE: Do not check runout on outside of wheel rim since this method can easily give a false reading.

4. CHECKING WHEEL FOR WOBBLE (LATERAL RUNOUT)

Before checking a wheel for wobble (lateral runout), make sure tire is properly mounted. Mount a dial indicator on firm base, with anvil of indicator resting against the flange of wheel. Rotate the wheel. If lateral runout is more than ⅛ inch (.125 inch), straighten or replace wheel.

5. BALANCING WHEEL AND TIRE ASSEMBLIES

Proper balance of wheel and tire assemblies promotes smooth steering action and is a safeguard against vibration and front end shake. To check froat wheels for balance, place jack under center of front of car and raise both front wheels off floor. **Do not place jack under lower control arms as this will tend to minimize vibration.**

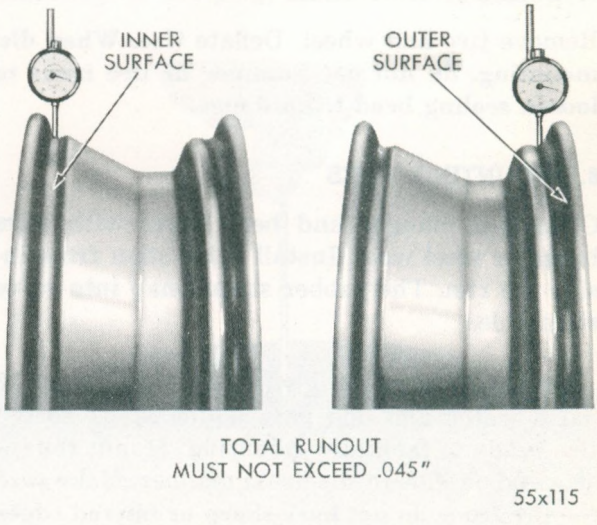

Fig. 2—If Radial Runout Exceeds .045 inch, replace Wheel

NOTE: Remove caked mud or tar from wheel so that balance condition will not be affected.

Using a spinner, rotate the wheel at a higher rate of speed than that encountered in actual highway driving. Place crumpled cloth or towel on front fender above center of wheel. Rotate the wheel up to high speeds. The wheel will vibrate profusely, if it is out of balance. If wheel is in balance, there will be no vibration at any speed.

If wheel is out of balance, mount it on master drum of wheel balancer to determine the proper location and amount of weight needed, or use wheel balancing equipment which checks balance with wheel on car. With this type of equipment, the balancing mechanism is clamped to the wheel assembly. When location and size of weights needed to balance wheel are determined, divide the amount and attach half of weight to inner rim and the other half to the outer rim of wheel.

To check balance of rear wheels, place jack under frame side rail about 12 inches forward of rear spring front hanger. Raise one wheel off the floor at a time. Block the other wheel. Place a crumpled cloth or towel on fender above wheel. With the engine running and transmission in direct drive, spin the wheels through speed ranges of 20, 30 and 40 miles per hours. **Do not exceed 40 miles per hour on the speedometer.**

The balance is correct if the cloth or towel does not vibrate. If wheel and tire assembly is out of balance, check with wheel balancing equipment and attach weights as needed.

TIRES

6. TUBELESS TIRES

The Tubeless Tires provide longer life and added protection against blowouts and punctures. A puncture can be repaired by using the repair plugs and other materials in the Tubeless Tire Repair Kit. Refer to Paragraph 10, for puncture repair procedures.

7. DISMOUNTING TIRES

Remove tire and wheel. Deflate tire. **When dismounting, do not use hammer or tire irons to loosen sealing bead from flange.**

8. MOUNTING TIRES

Clean rim flanges and bead seats with wire brush or steel wool. Install valve stem from inside the rim. The rubber stems snap into valve stem hole.

Apply MOPAR Ruglyde (or mixture of 12 parts water and one part liquid soap) to the tire beads to facilitate mounting. Mount the inside and outside in the usual manner. **Make sure the tire irons do not have sharp or burred edges and work with care to avoid damaging the tire beads.**

Apply a blast of air, after tire is mounted on rim. If beads do not seat sufficiently to hold the pressure, spread by constricting the centerline of tread with a tire mounting band, as shown in Figures 3 and 4 or a rope tourniquet. To make a tourniquet around the tire use one or more turns of rope. Tighten by twisting rope with tire tool, and pound on tread at various places to evenly distribute the tension.

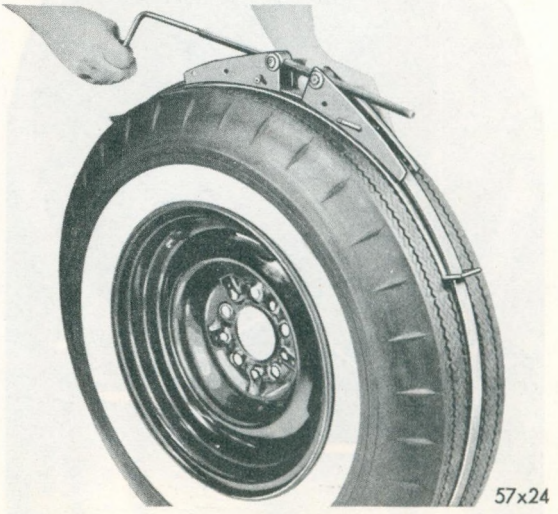

Fig. 3—Constricting Centerline of Tire with Mechanical Tool

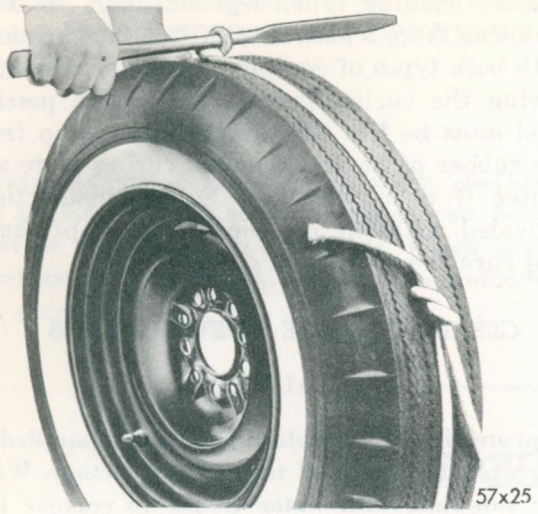

Fig. 4—Constricting Centerline of Tire with Rope Tourniquet

When the tire beads seat, remove the mounting band or rope tourniquet.

CAUTION

Release tension on mounting band or rope tourniquet when inflation takes effect and before pressure begins to build up.

Install valve core and inflate tire to recommended pressure. Test tire and wheel assembly for leakage, in Paragraph 9.

9. TESTING THE TIRE AND WHEEL ASSEMBLY FOR LEAKAGE

When testing for leakage, do not remove tire from rim. Examine tire carefully for puncturing object. If tire is flat, inflate and listen for first air leak. If air leakage is slow and cannot be heard, remove tire from car and submerge in water test tank.

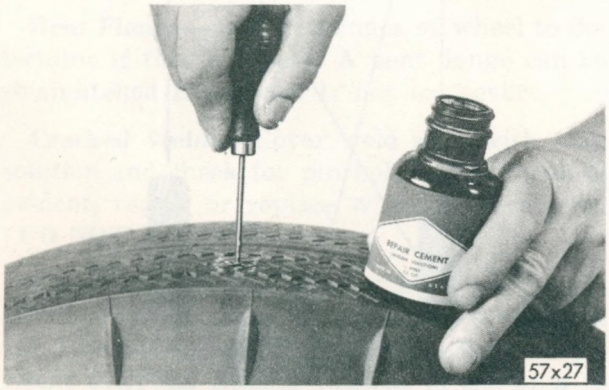

Fig. 5—Lubricating Puncture with Cement

Apply a soap solution, if test tank is not available, covering surface of tire, the valve stem, and the juncture of tire and rim flange. A slow leak will be indicated by an accumulation of soap bubbles.

10. REPAIRING PUNCTURES

a. Tire on Wheel (Outside Method)

Simple punctures can usually be repaired with tire mounted on wheel, using items in repair kit. The operation can best be performed when tire is flat. It can also be accomplished while tire is inflated.

Remove the puncturing object. Dip needle inserting tool in the cement provided in repair kit, and carefully probe in hole to determine its direction. After direction of hole is determined, continue to probe until the rubber around the hole is well covered with cement, as shown in Figure 5.

CAUTION

If the needle appears to be blocked, do not force it into hole as otherwise, an additional hole may be made, and two holes will be difficult to seal. Twist and turn needle to find the hole, if needle does not insert freely.

Select a repair plug according to size of hole. The repair plug should have a diameter about twice the size of hole, because soft rubber will stretch when inserted with needle. Roll small end of repair plug into "eye" of needle, 3/8 inch from end of the plug, as shown in Figure 6.

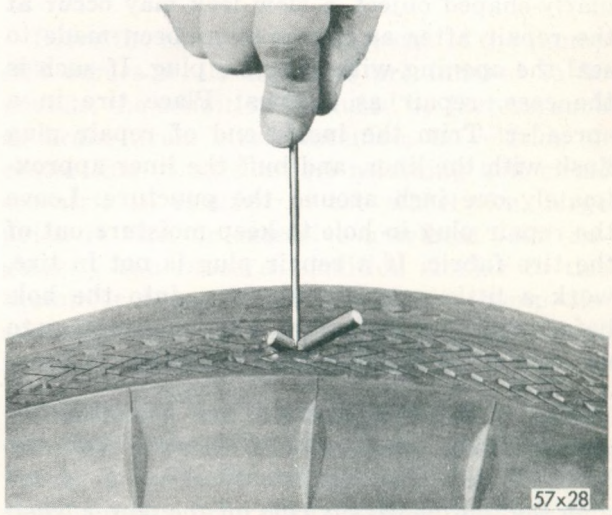

Fig. 6—Inserting Needle and Plug in Puncture

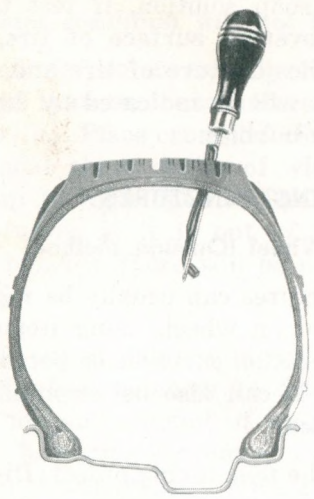

Fig. 7—Plug and Needle in Puncture (Sec. View)

Dip repair plug and needle into cement, and immediately insert in hole with a firm, steady motion, until short end of repair plug snaps through tire, as shown in Figure 7. Pull needle straight out of hole. The plug will automatically unhook from the needle as this is done. Trim plug about 1/8 inch above tread of tire. Inflate tire, check for leakage, and tire is ready for use.

The portion of plug, which protrudes slightly above the tire tread, will wear down to the tread surface. The portion of the plug inside the tire will not affect normal operation.

b. Tire Off Wheel (Inside Method)

When the tire has been punctured by an irregularly-shaped object, a slow leak may occur at the repair after an attempt has been made to seal the opening with a repair plug. If such is the case, repair as follows: Place tire in a spreader. Trim the inside end of repair plug flush with the liner, and buff the liner approximately one inch around the puncture. Leave the repair plug in hole to keep moisture out of the tire fabric. If a repair plug is not in tire, work a little extra repair gum into the hole before applying the patch. It is not necessary to use cement to obtain a good adhesion.

Two types of equipment are available for curing inside patches—the Electric and the Match Patch. The Electric type has a "fuse" plug that automatically cuts off the power when the curing is completed. The Match Patch, or powder burning type, depends upon the heat resulting from a slow fire. "C" clamps are used with both types of equipment to apply pressure during the curing process. **All inside patches used must be Hot Patches.** Peel the strip from the rubber patch on the metal curing plate and center it over puncture. Follow instructions provided with the equipment, apply pressure, and cure the patch.

11. CLEANING WHITE SIDEWALL TIRES

CAUTION

A protective, water-soluble coating is applied to the white sidewalls of tires at the factory. Wash the sidewalls with water ONLY to remove this coating. DO NOT USE gasoline or a wire brush.

To clean white sidewall tires, use a good kitchen cleanser and a stiff brush. **Do not use gasoline or any wire, metal, etc. brush, as they will scratch the sidewalls.**

12. RECOMMENDED TIRE PRESSURES

The tires must receive proper care to insure maximum tire lift. Under-inflation contributes to wear and causes excessive heat. Over-inflation causes excessive strain and, as a result, the tire is subject to break or bruise. Tire pressure should be checked at least once a week. 22 pounds is the recommended COLD tire pressure. Tire pressures will increase approximately

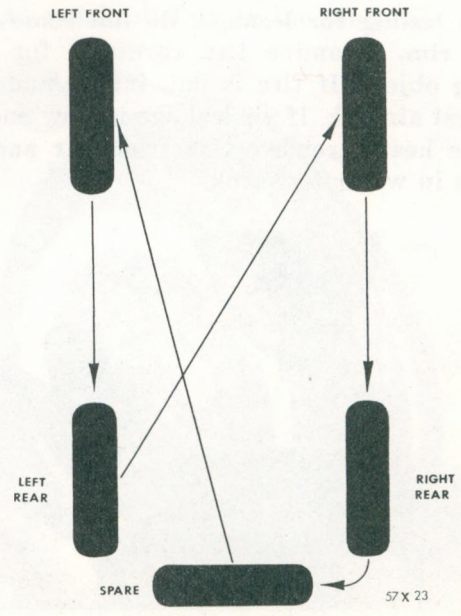

Fig. 8—Tire Rotation

3 psi in city driving and 5 psi for country driving. **NEVER BLEED BUILT UP PRESSURE IN A TIRE.**

CAUTION

Always use an accurate gauge when checking tire pressure. An inaccurate gauge can be in error as much as 2 or 3 pounds, which is approximately 10 per cent of the recommended tire pressure.

Make sure the valve caps are tight, after checking tire pressure.

13. TIRE ROTATION

Rotating tires at intervals of 3,000 miles is the only known method of controlling certain types of tire wear. Tire life (Fig. 8) can be increased as much as 25 per cent by regularly rotating the tires, including the spare.

SERVICE DIAGNOSIS

14. LEAKAGE CAUSES AND CORRECTIVE METHODS

Valve Leak—This type of leak is usually indicated by bubbles at the valve stem after soap solution is applied at this point. Make sure that the rim is clean around the valve hole. If a "snap-in" type rubber valve leaks, it must be replaced.

Rim Leaks—If the leak is at the top of rim flange (between flange and tire bead, mark location of leak on tire and rim, and dismount tire.)

Rusty Rim—Remove rust with scraper and finish the operation with wire brush or steel wool. Apply MOPAR Rubber Cement thickly to tire and rim flange. Mount tire to rim while cement is still wet.

Foreign Material Embedded In Sealing Grooves of Rim—Remove with wire brush or screwdriver blade. Apply MOPAR Rubber Cement thickly to the cleared area, and mount tire while cement is wet.

Bent Flange—Inspect flanges of wheel to determine if they are bent. A bent flange can be straightened if damage is not too severe.

Cracked Welds—Cover weld area with soap solution and check for pin hole leak. If leak is evident, repair or replace wheel as necessary. **(DO NOT WELD RIM.)**

Heavy Rim Weld—A slow leak may result if rim weld has not been dressed down. Use a flat file to smooth off the weld in the flange area. Apply MOPAR Rubber Cement in the area to help "make" the seal.

Cracked Rim—A rim seldom cracks unless it has been welded or badly overloaded. **Do not try to repair a welded rim, install a new wheel.**

15. TIRE THUMP

Tire thump is a pounding action that occurs each time a tire rotates. In most instances, tire thump is evident at speeds under 45 miles per hour on a smooth road, **and is usually restricted to a small speed range.** If the thump is slight and difficult to detect, the condition may be considered acceptable, and tire life will not be affected.

When checking for cause of tire thump, inspect all tires for uneven wear, and make sure the beads of all tires are properly seated in the wheel rims. Inflate all tires to 50 pounds pressure. This will eliminate or reduce thump, if it is due to tire irregularities.

Drive the car on a smooth road. If the thump still occurs while the tires are inflated to 50 pounds, the condition is caused by factors, such as brake drum circle eccentric in relation to center line of axle, wheel retaining bolt circle eccentric in relation to the wheel rim, large patch in tire, or excessive universal joint angularity can cause a condition similar to tire thump or roughness. However, if thump disappears when tires are inflated to 50 pounds pressure, make the following test:

Deflate one tire to 25 pounds and drive car on smooth road. If thump appears, the deflated tire is at fault. Repeat test until all tires, including spare, have been checked. Only one tire at a time should be deflated to 25 pounds pres-

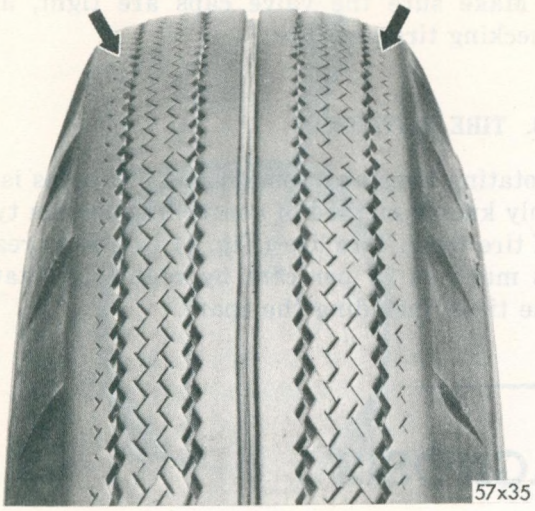

Fig. 9—Under-Inflation Wear

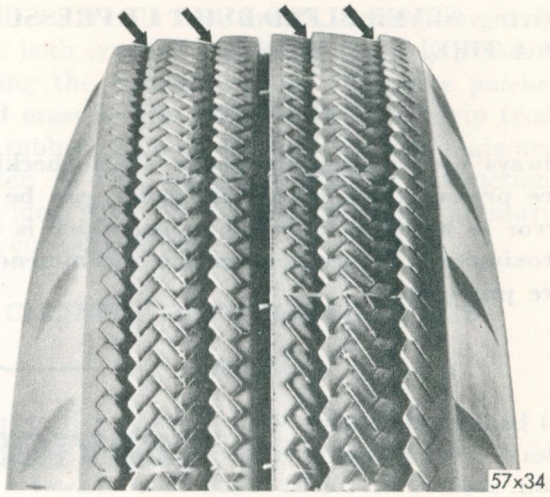

Fig. 12—Toe-Out Wear

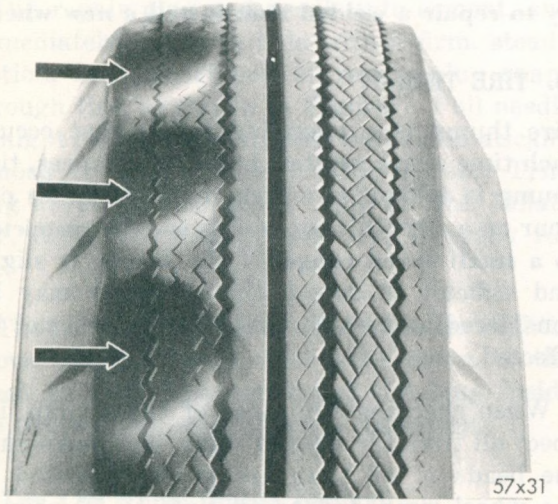

Fig. 10—Spotty Wear

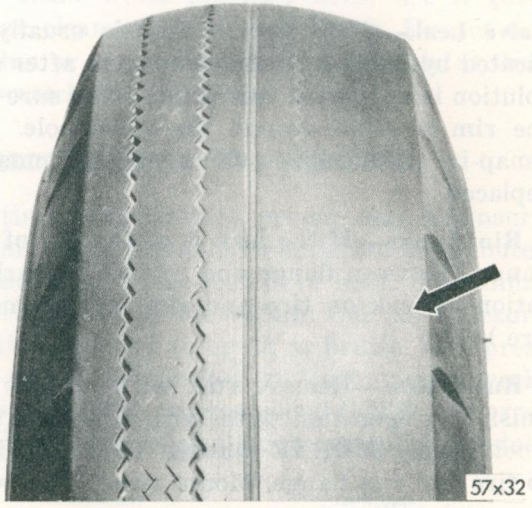

Fig. 13—Camber Wear

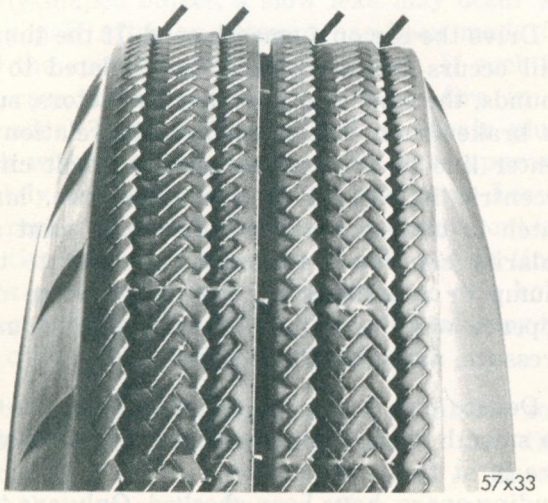

Fig. 11—Toe-In Wear

Fig. 14—Over-Inflation

sure for testing. Reinflate the tire already tested before proceeding to the next tire.

NOTE

Sometimes, a thumping tire will operate satisfactorily when changed from one side of the car to the other. This changes the direction of the tire's rotation. In severe cases of tire thump, it may be necessary to replace the tires in question.

16. TIRE WEAR

Inflate tires to proper pressure recommended in Paragraph 12. (Refer to Fig. 9). When tires are under-inflated, excessive wear occurs at the two tread ribs next to the inner and outer shoulder ribs. Wear occurs at center of tread when tire is driven over-inflated.

a. Spotty Wear (Fig. 10) usually becomes evident on front tires when tires are not rotated every 3,000 miles.

b. Excessive toe-in or toe-out (Figs. 11 and 12) of front wheels affects the rate of tire wear more than any other factor.

c. (Refer to Fig. 13). Excessive positive camber will develop noticeable wear on the outer ribs of tires. Excessive negative camber will result in noticeable wear on the inside ribs.

d. Check for wheel wobble. Straighten or replace wheel, if necessary.

e. Check for worn ball joints. Replace as necessary.

f. Check for wear caused by sustained high speed driving, and driving around corners too fast.

g. Check for over-inflation (Fig. 14).

Section XIV

BODY, BODY WIRING AND SHEET METAL

INCLUDING TOWN AND COUNTRY WAGON

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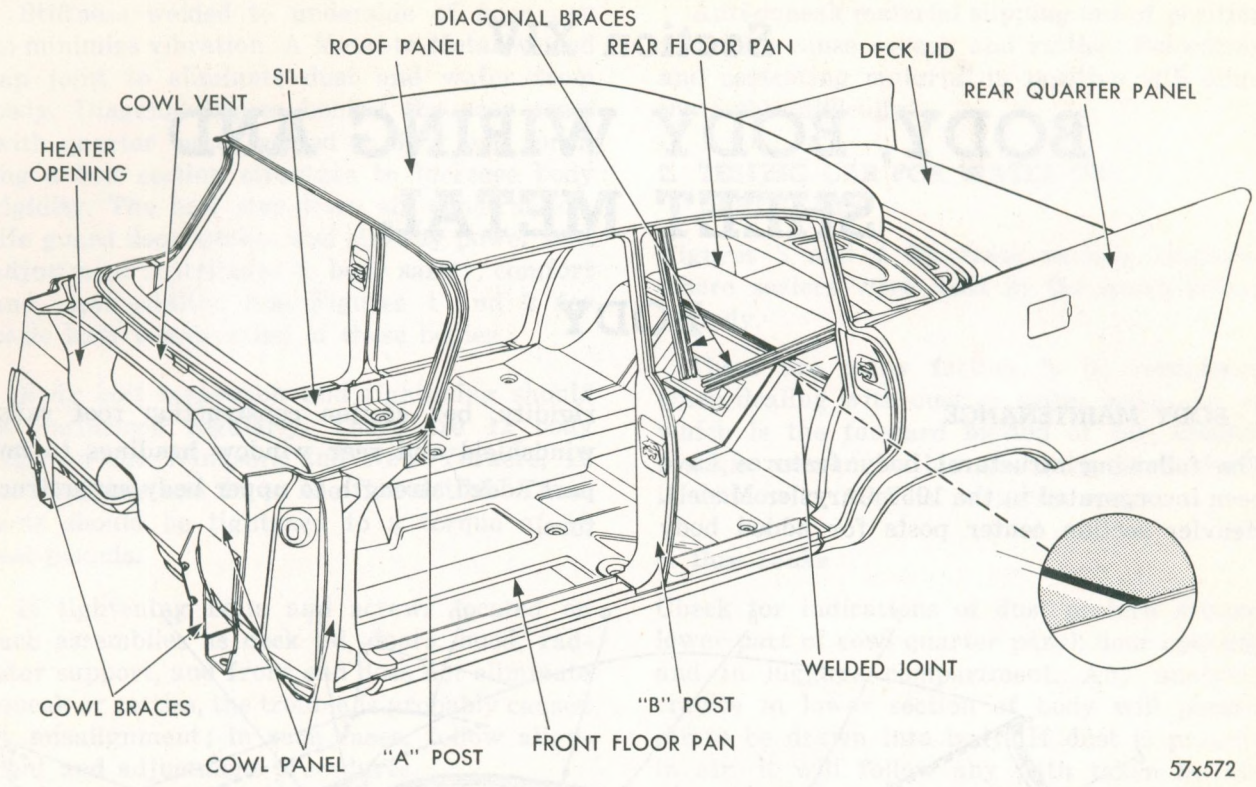


Fig. 1—Basic Body Construction (C-75, C-76)

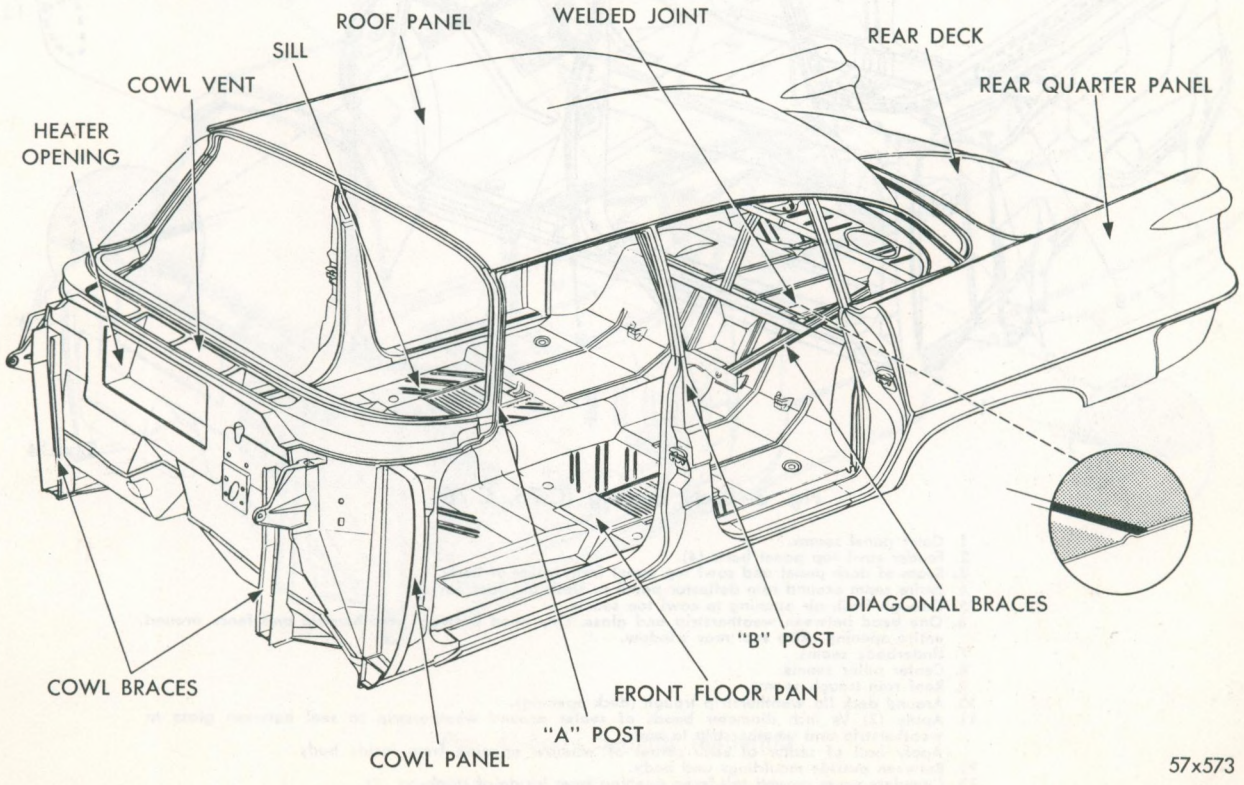


Fig. 2—Basic Body Construction (Imperial)

Section XIV

BODY, BODY WIRING AND SHEET METAL

BODY

1. BODY MAINTENANCE

The following structural body features have been incorporated in the 1957 Chrysler Models. Heavier section center posts for added body rigidity, box section construction roof rails, windshield and rear window headings to impart added strength to upper body superstructure.

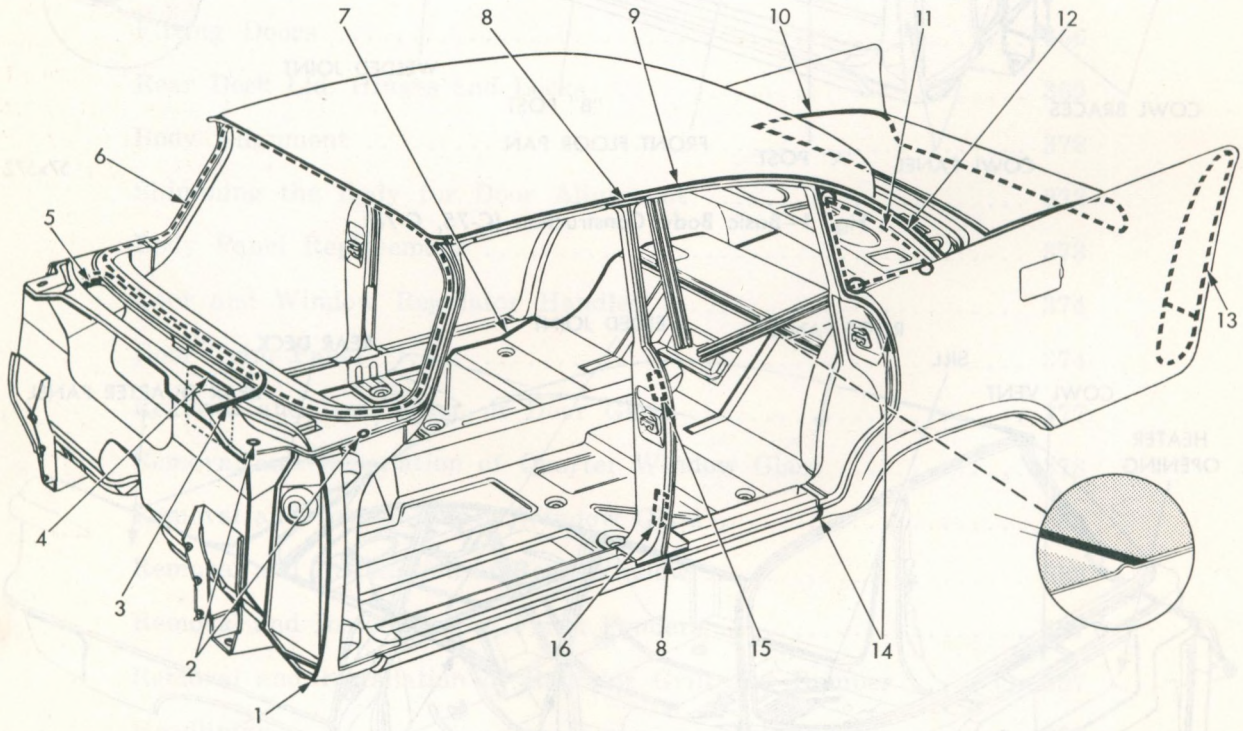


Fig. 3—Body Sealing (C-75, C-76)

1. Cowl panel seams.
2. Fender cowl top panel bolts (4).
3. Seam of dash panel and cowl top panel from inside of body.
4. Entire seam around rain deflector panel to fresh air door cover.
5. Through fresh air opening to cowl top seams.
6. One bead between weatherstrip and glass. One bead between weatherstrip and fence around entire opening. Also seal rear window.
7. Underbody seams.
8. Center pillar seams.
9. Roof rain trough seams.
10. Around deck lid weatherstrip trough (deck opening).
11. Apply (2) 1/8 inch diameter beads of sealer around weatherstrip to seal between glass to weatherstrip and weatherstrip to body.
    Apply ball of sealer at each corner of window opening from inside body.
12. Between outside mouldings and body.
13. Complete seam around tail lamp opening from inside of trunk.
14. Quarter panel seams.
15. Center pillar cap and pillar.
16. Pillar around rear door hinges.

Stiffness welded to underside of floor pan to minimize vibration. A Metal-to-Metal welded lap joint to eliminate dust and water from body. Diagonal braces behind the rear seats with quarter panel welded to floor pan forming a box section structure to increase body rigidity. The new step-down sill construction, life guard door latches and six-way power seat adjustment contributes to body safety, comfort and serviceability. See Figures 1 and 2 for basic body construction of these bodies.

Body bolt inspection and tightening should be performed regularly. There are 12 body bolts on the Windsors and New Yorkers, 12 on Imperials and 14 on the Convertible. These bolts should be tightened to a torque of 18 foot-pounds.

If tightening bolts and screws located on such assemblies as deck lid, doors, hood, radiator support, and front end does not eliminate squeak or rattles, the trouble is probably caused by misalignment; in such cases, follow alignment and adjustment procedures.

Anti-squeak material slipping out of position may also cause squeak and rattles. Relocating and cementing material in position will eliminate this difficulty.

2. TESTING CAR FOR WATER OR DUST LEAKS

Figures 3 and 4 illustrate various locations where sealers were used in the manufacture of body.

There are many factors to be considered when dealing with dust or water leaks, one of which is the forward motion of car, creates a slight vacuum within the body, particularly if window or vent is part-way open.

a. Dust Leaks

Check for indications of dust pattern around lower part of cowl quarter panel, door opening and in luggage compartment. Any unsealed crevice in lower section of body will permit air to be drawn into body. If dust is present in air, it will follow any path taken by air

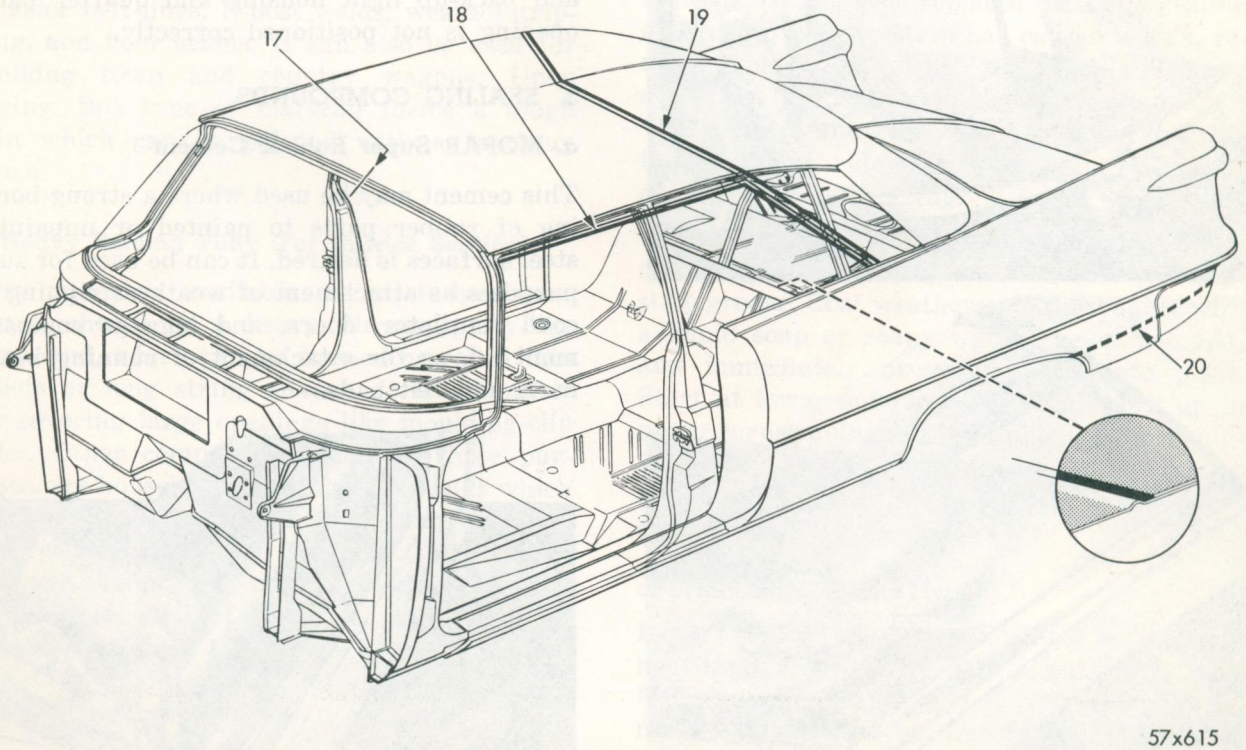


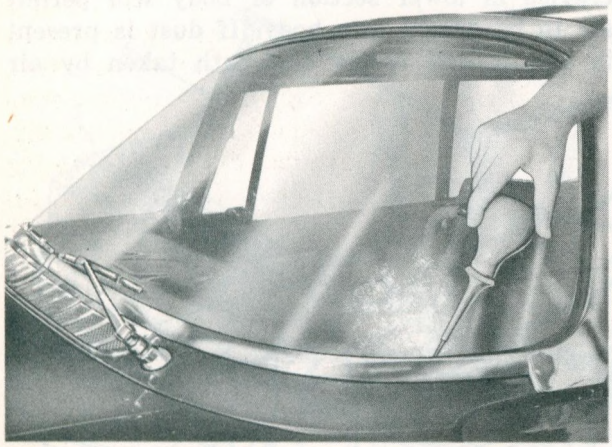
Fig. 4—Body Sealing (Imperial)

17. Windshield header outside finish moulding (Convertible).
18. Between roof rail weatherstrip and body.
19. Roof panel seams. (Hardtop)
20. Floor pan to quarter panel seam.

from point of entry into passenger and luggage compartments. To eliminate dust leaks, the first step is to determine exact point at which dust enters. The location of point of entry may often be deceptive; dust may enter at one point, then follow passages to another point.

b. Water Leaks

Testing a car for water or dust leaks should be done by sections. Make visual inspection in locality where leaks are found. In many instances, cause of leakage may be obvious. A flashlight is very useful in locating source of leak, especially at metal joint or where moulding clip hole is suspected of leaking. If source of leak cannot be found through visual inspection or with flashlight, a trace powder bulb test should be made to determine exact location of leak. See Figures 5 and 6 for example of testing for leaks with trace powder. Trace powder should be sprayed to lowest point of suspected area, then gradually move spray up slowly, until source of leak is located. Each leak can be located and marked before moving on up to check for other possible points of leakage. After a complete test is made, it is essential that area be properly sealed with MOPAR Sealer.



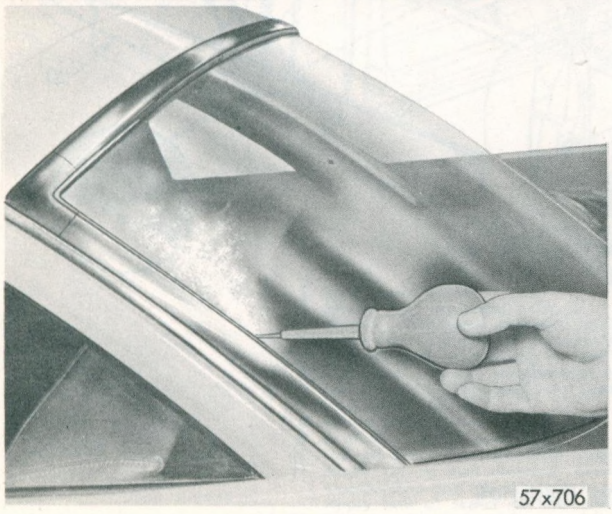


Fig. 5—Checking W/S and R/W Glass for Leaks with Tracing Powder

Before testing deck lid, make certain that deck lid is properly fitted. Test from bottom of deck lid and work slowly toward top, on each side. Then work across top of lid. If leakage occurs at seam between weatherstrip trough and deck upper panel and rear quarter panel, pack entire length of underside of welding seams with Permagum.

It is advisable, when checking leaks in car, to start with cowl vent intake and plenum chamber housing, then windshield wiper pivots, windshield, vent wings, doors, drip mouldings, and remainder of body.

Test tail and back-up light area and belt moulding around deck quarter for possible leakage into luggage compartment. Water will also enter trunk area if rubber seal between tail and back-up light housing and quarter panel opening is not positioned correctly.

3. SEALING COMPOUNDS

a. MOPAR Super Rubber Cement

This cement may be used where a strong bonding of rubber parts to painted or unpainted steel surfaces is desired. It can be used for such purposes as attachment of weatherstripping at cowl ventilator, doors, and luggage compartment lid, or for attachment of running board mats and felt pads.

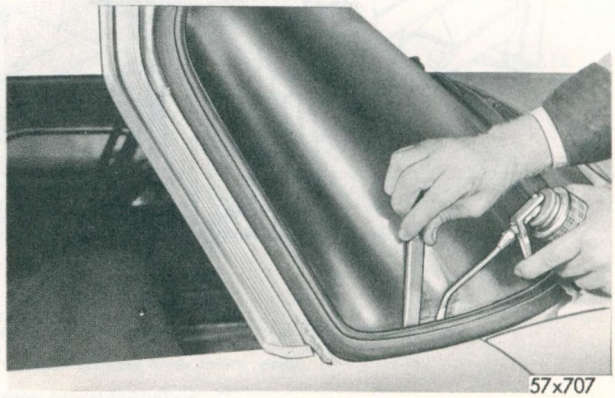


Fig. 6—Sealing Weatherstrip with Sealer Gun

b. MOPAR Windshield Rubber Sealer

This sealer, a light viscosity, colorless, rubber expander, can be used where rubber is confined between glass and metal channel, such as windshield and rear window glass assembled in one-piece type weatherstrips. When applied to edge of rubber, it will expand rubber within 15 to 20 minutes. This sealer will not harm paint or chrome finish and can easily be removed with cloth before it sets.

c. MOPAR Perfect Seal Sealing Compound

This sealer can be used for all types of threaded joints, gaskets, and machined joints. The compound never dries out — never sets hard. It is not soluble in gasoline, oil, anti-freeze solutions or water. It prevents corrosion, protects against contraction without seepage or leaks and can be applied with brush supplied in lid of container.

d. Body Seam Sealers (For External Sealing)

Sealers for this purpose are available through local sources. These commercial sealers can be used along welded joints, exterior roof rails, exterior belt lines, B-post welds, weatherstripping, and floor seams. It can also be used for caulking town and country wagons. Upon drying, this type of material forms a tough skin which can be painted with a touch-up brush.

e. Heavy Sealing Putty (For Interior Sealing)

This material, available at most hardware stores, should be a heavy fibrous, putty-like compound, which can be formed or rolled into pellets or long string shapes. It is adaptable for covering large openings like moulding-clip holes. Other compounds, used for these purposes, are household caulking compounds which do not completely harden, Permagum, or body undercoating materials. The latter compounds, however, cannot be painted. **Before sealing, always clean all surfaces to be cemented with unleaded gasoline. Do not use kerosene, as this liquid leaves a thin film of oil which will prevent adequate adhesion of sealer.**

4. BODY SEALING PROCEDURES

Surfaces to be sealed or cemented should be cleaned of all dirt, grease, and other compounds, preferably with clean unleaded gasoline or cleaner's naphtha.

a. Front Vent Wing Pivot Pins

Seal openings around these pins with heavy sealing putty. It may be necessary to properly position weatherstrip at top and around vent wing. To do this, insert a shim between retainer and weatherstrip to obtain a better fit. Use liquid soap around moulding to lubricate weatherstrip. When reinstalling weatherstrip, use a rubber mallet if necessary.

b. Windshield Weatherstrip

To remove strip, remove clips, carefully insert wooden wedge between weatherstrip and moulding at end of moulding to get it started. Seal weatherstrip against body opening by carefully working a thin coating of MOPAR Windshield Rubber Sealer, (Fig. 6) or Body Seam Sealer, between body edge and rubber moulding, or lift lip or rubber weatherstrip where it contacts body metal, and use a nozzle-type applicator (sealer gun) to force sealer deeply around entire edge. It is rarely necessary to reseal between glass and weatherstrip, unless glass has been replaced. If faulty sealing of glass to weatherstrip has caused a leak, remove windshield garnish moulding and apply sealer as far down as possible between inner weatherstrip and glass, for a considerable distance on each side of leakage point. Clean off excess sealer with a rag.

To reinstall chrome moulding, thoroughly clean edge of moulding that fits into weatherstrip groove. Coat weatherstrip thoroughly with a liquid soap or soapy water (never use oil), and immediately press moulding into place. Start at lower outside corner and work up in upper corner going around full length of moulding — top and bottom. If necessary, use rubber mallet and tap moulding lightly on inside edges near glass.

c. Windshield Wiper Pivots

Inspect gasket between windshield wiper pivot housing and cowl to see if it is out of position. If leakage is evident at that point under cowl, remove wiper housing, and install a new gasket coated with windshield sealer.

d. Deck Lid (Figs. 3 and 4)

Leakage around deck lid is usually caused by

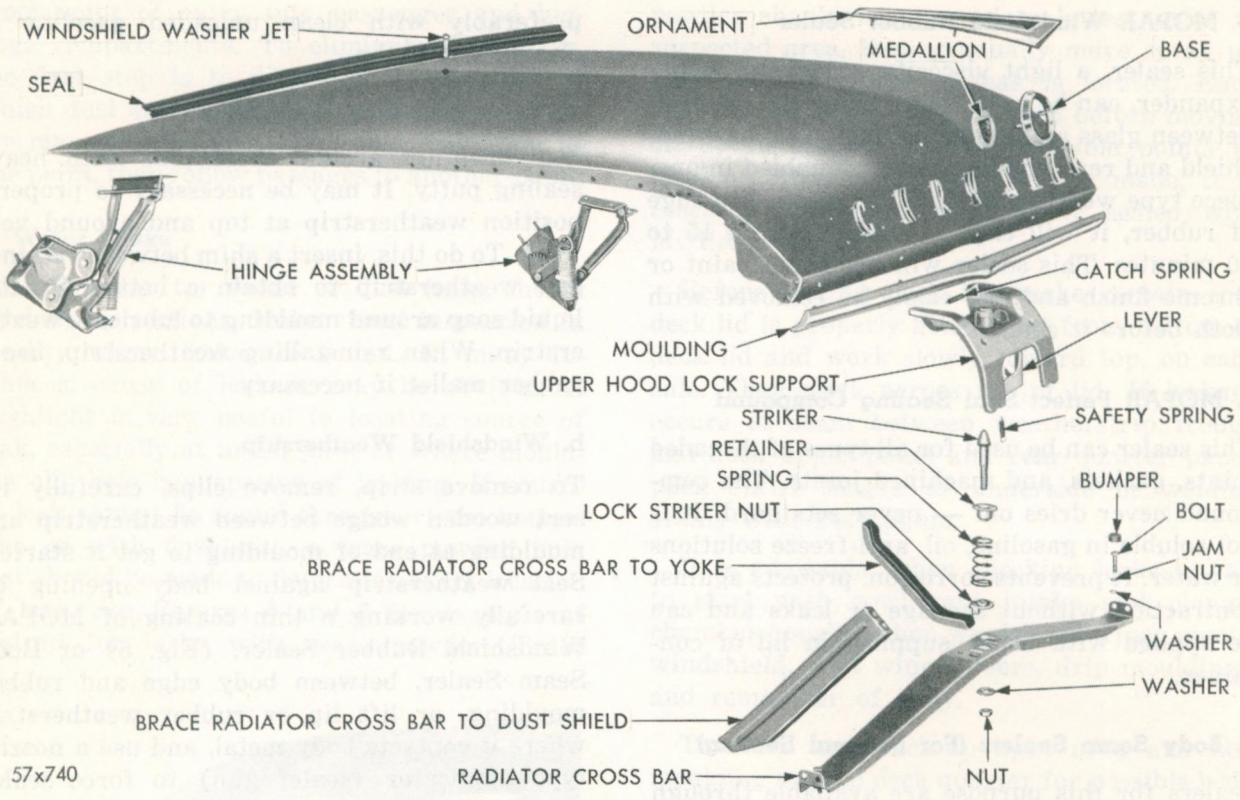


Fig. 7—Hood (Disassembled View) (C-75, C-76)

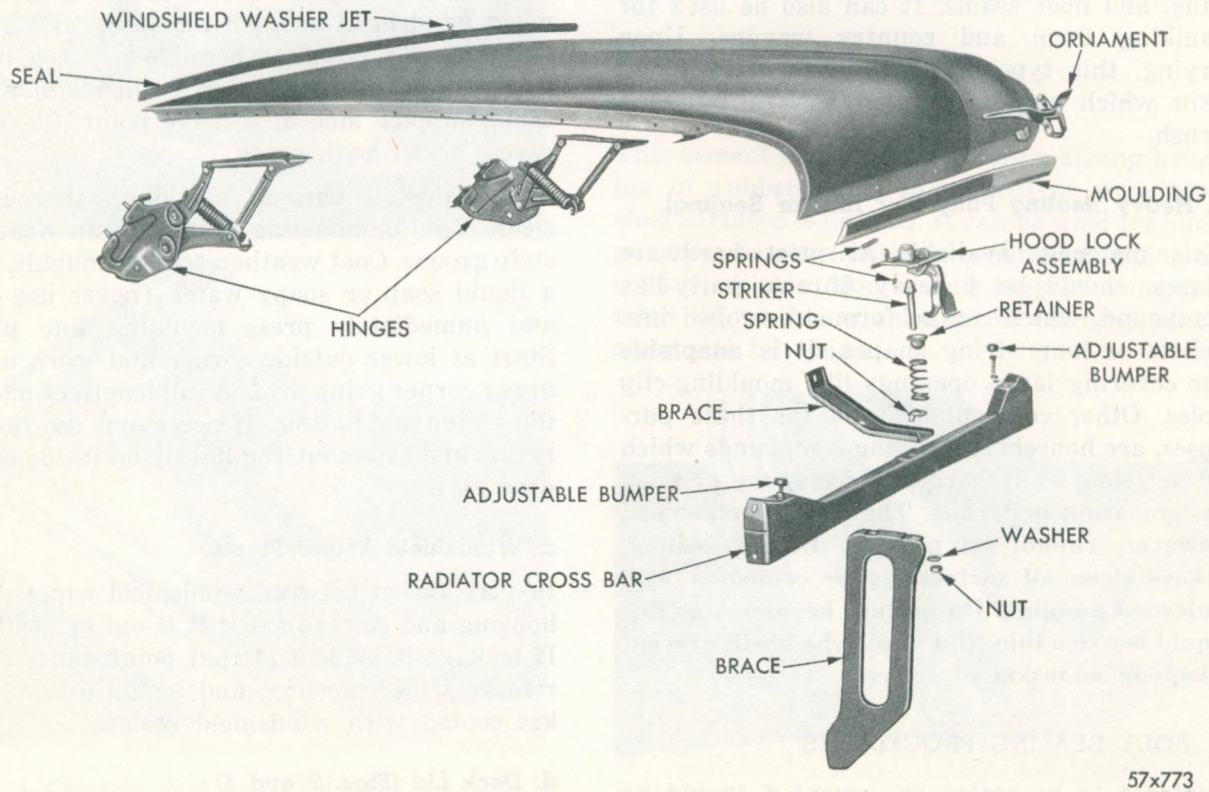


Fig. 8—Hood (Disassembled View) (Imperial)

worn or misaligned weatherstrip or lack of sufficient cement between rubber weatherstrip and body channel. It may also be caused by insufficient contact between deck lid and weatherstrip, which may indicate the need for refitting lid (see Paragraph 2 of this section) or replacing weatherstrip.

When a leak caused by insufficient sealer is found, pull up loose section of weatherstrip, and clean channel where possible with solvent. Apply a coat of MOPAR Super Rubber Cement, or its equivalent, to weatherstrip and body channel. Replace weatherstrip immediately and press firmly in place. **Care should be taken not to stretch weatherstrip during replacement, especially at corners.**

When replacement of weatherstrip is necessary, remove defective section of weatherstrip. Clean metal surface with solvent, to remove all traces of old weatherstrip. Coat channel and weatherstrip with cement. Install new weatherstrip and press firmly into place. Close deck lid and allow to stand until weatherstrip is firmly attached. Test for water leaks. If leaks occur at welded joints of rear trunk compartment weatherstrip channel, reseal joint from inside channel. On Imperial models check tail lamp for fit in body, belt and chrome mouldings. Reseal around base of tail lamp and moulding if opening exists.

e. Drip Moulding (Figs. 3 and 4)

Check entire length of this moulding for possible openings. Using a thin wooden paddle, or a nozzle-type applicator, seal such openings with body seal sealer. A caulking gun may also be used. Touch up newly-sealed points with paint to match color of body.

f. B-Post Weld

This weld is below center of drip moulding. Apply body seam sealer along welded seam. Low spots in junction of A and B post and roof rail can cause leaks under door flange weatherstrip. Fill in and reseal with seam sealer.

g. Cowl Panel Joint

Clean the seamed area thoroughly and apply heavy sealing putty or body seam sealer. Be sure to apply sealer over hood hinge bracket and along seam to rear end of front fender.

h. Cowl Quarter and Hood Ledge Seam

Inspect various openings in cowl for possible leakage. Check for openings and cracks in seal along seam in engine compartment. Seal with heavy sealing putty as necessary.

i. Door Hinges and Door Panels

Check sealer on door hinges at pillar post. The sealer should be filled flush with pillar post. This should be done after door fitting, as sealer may become cracked or loose. Check recess in door panel just below door glass vent window to insure that weatherstrip tapes are in position over recess. Replace and reseal as necessary.

j. Rear Window Glass

If rear window glass has been replaced and is too high in rear window opening, it may allow water to leak in on each side of body. Use a heavy-bodied sealer between rubber weatherstrip and body fence to hold weatherstrip up at these points.

k. Rear Outer Panel

The holes at each end, and center of rear quarter panel, for attaching rear window lower trim moulding, are elongated and should have sealer applied around moulding clips. Apply heavy body sealer from underside of quarter panel and trunk compartment, if leaks occur at panel and trunk compartment. If leaks occur at the dog leg of the front "A" post, they may be due to loose secondary seals. If leaks occur at the welded joints of rear trunk compartment weatherstrip channel apply sealer from inside channel to close openings.

l. Rear Wheel Housing

Check for buckles between spot welds of rear wheel housing. Apply generous amount of heavy-bodied sealer at buckled points.

m. Rear Vent Windows

Make sure there is adequate pressure against vent glass frame by vent window weatherstrip. If not, remove door garnish moulding and pry down on weatherstrip retainer to give necessary pressure against vent glass channel.

n. Rear Compartment

Water on rear or trunk carpets should be due

to water entering rear window weatherstrip at spot welds in body fence or flange along top of window opening and then traveling inside weatherstrip to lower radius and spilling out. Leaks between weatherstrip and fence should be sealed by removing trim moulding and applying a tape sealer between weatherstrip and fence. Press sealer in tightly so that it is forced up between the weatherstrip and fence. Reapply sealer around ornament studs, etc.

5. REMOVAL, INSTALLATION, AND ADJUSTMENT OF HOOD

a. Removal

The method of hood attachment is shown in Figures 7 and 8. Raise hood and remove three of four nuts and washers attaching hood to hinge on each side of hood. Mark outline of hinge on hood with chalk to facilitate aligning. Brace hood so that it will not slide to rear, damaging painted surfaces of cowl or fenders. With helper, remove other two attaching nuts and washers and lift hood from car.

b. Installation

When installing, use helper to assist in mounting hood to hinges. Install attaching washers and nuts; align hinges with aligning marks. Tighten nuts a little more than finger tight. Close hood, align and adjust as follows: Seal top of hood hinge bracket to dash panel with sealing putty.

c. Adjustment

Hood Fits Cowl Loosely—If one side of hood is raised at cowl and the other side is low, adjust hood hinges to body. Loosen all fastenings (hinge to body) (Fig. 9), close hood and position within hood opening and then tighten rear fastening of hinges. Open hood and tighten balance of fastenings. Equalizing the hood fit may result in center of hood being higher than cowl surface. If this happens, bend hinge rear strainer (Fig. 10) to obtain correct fit. To bend strainer, place on "S" hook over center strainer. Slide a bar, (Fig. 11) through lower opening of an "S" hook so that end of bar is hooked under cowl. Pry gently on strainer and check hood to cowl fit.

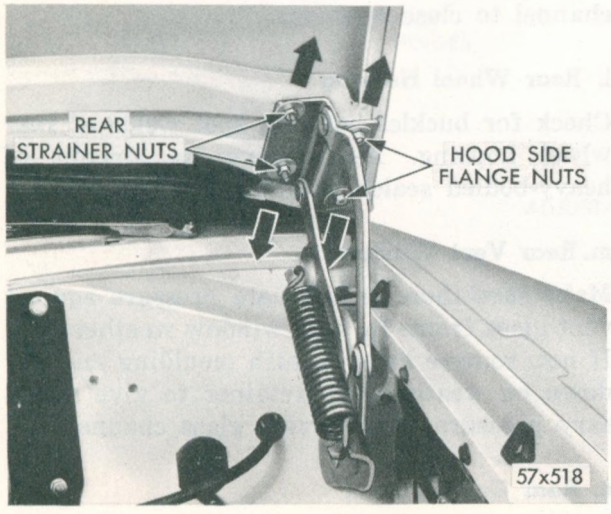


Fig. 9—Hood Attachment

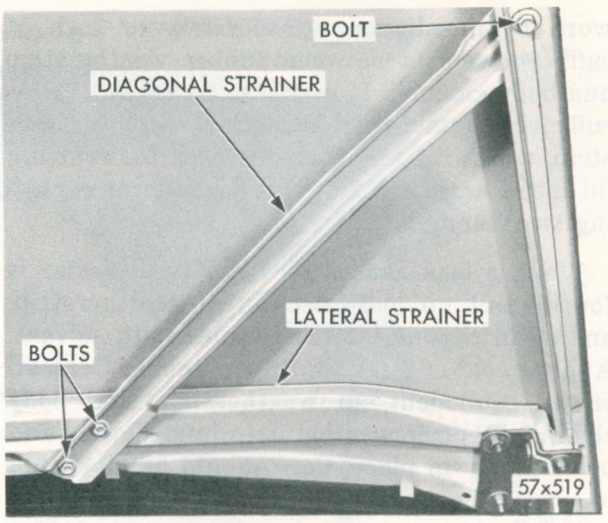


Fig. 10—Diagonal Strainers

Rear of Fender Lower than Cowl Panel—To raise rear of fender at door-cowl meeting, loosen bolts that attach fender to cowl quarter,

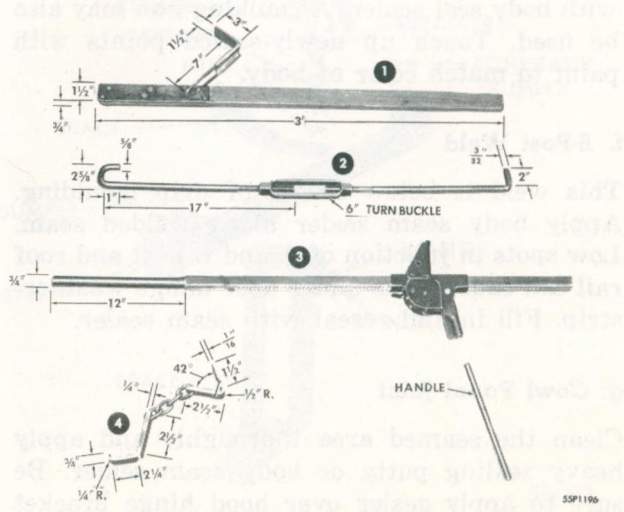


Fig. 11—Body Adjusting Tool

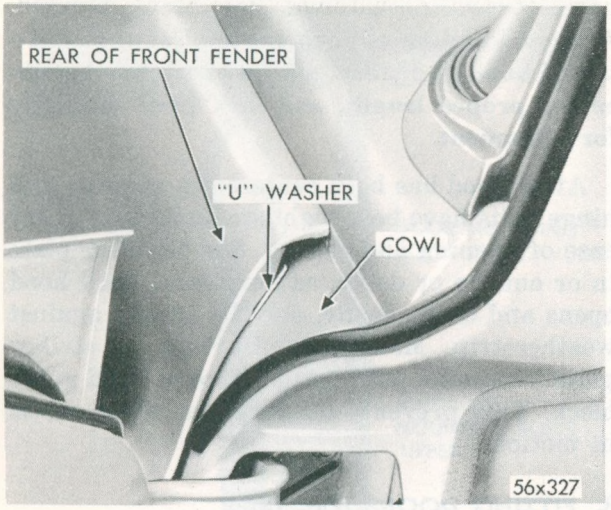


Fig. 12—Shimming Front Fender

raise fender, using jack until correct position has been obtained. Install horseshoe shims between cowl and fender bracket, as shown in Figure 12. Retighten bolts securely.

Hood Does Not Follow Contour of Fender—Insert small block of wood about one inch square between fender flange and hood opposite low spot on hood. Close hood slowly. With hand placed ahead of wood block apply pressure gently to hood. Repeat operation about every six inches until correct hood fit is obtained.

Hood Projects Beyond Front of Fender—This condition can be corrected by shifting fender forward with standard bumper jack with 10½ inch steel plate welded to base, as shown in Figure 13. To correct this condition, loosen bolts holding front fender to cowl side of panel. Place extension end of jack against hinge bracket on side of cowl panel and base of jack against upper section of radiator support, as shown in Figure 13. Extend jack carefully while checking clearance between rear edge of fender and leading edge of front door. When correct hood to fender fit is obtained, tighten fender to cowl bolts securely. Remove jack.

Front of Hood is Higher Than Fenders—Check rear edge of hood to see if hood fits correctly at cowl. If fit at cowl is correct, check hood striker and latch assembly. If striker plate is lowered, front of hood will be drawn down. The front hood bumper on grille panel should also be adjusted to compensate for lowering of hood.

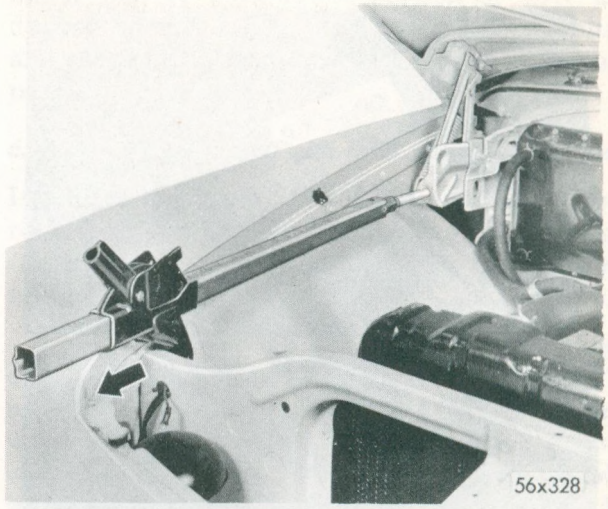


Fig. 13—Moving Fender Forward (Typical)

Hood Low at Cowl Panel—Prop open hood to relieve tension on hinge springs. Loosen nut at plate attaching hinge-to-cowl support bracket. Drive front portion of hinge downward and forward with a blunt drift, until correct spacing is obtained between hood and cowl panel. Tighten hinge retaining nut securely.

Excessive Space Between Leading Edge of Front Door and Edge of Fender—To correct this condition, adjust as follows:

Loosen fender-to-cowl bracket stud nuts and fender-to-cowl side panel bolts. Install drawbar by hooking one end of bar over hood hinge support bracket on cowl and other end over radiator support, as shown in Figure 14. Tighten turnbuckle until fender-to-door spacing is

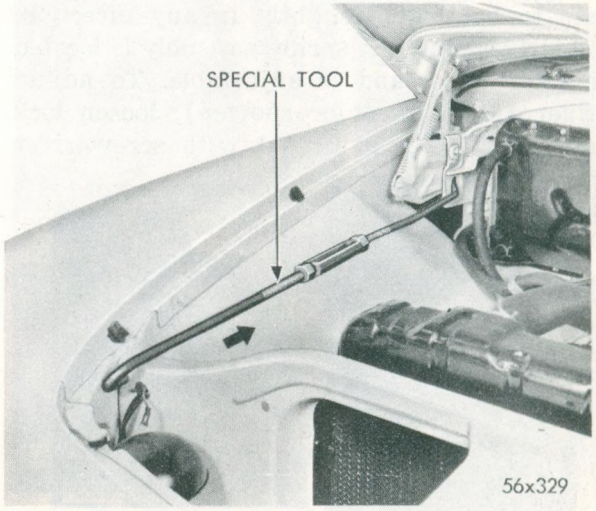


Fig. 14—Pulling Front Fender in Position (Typical)

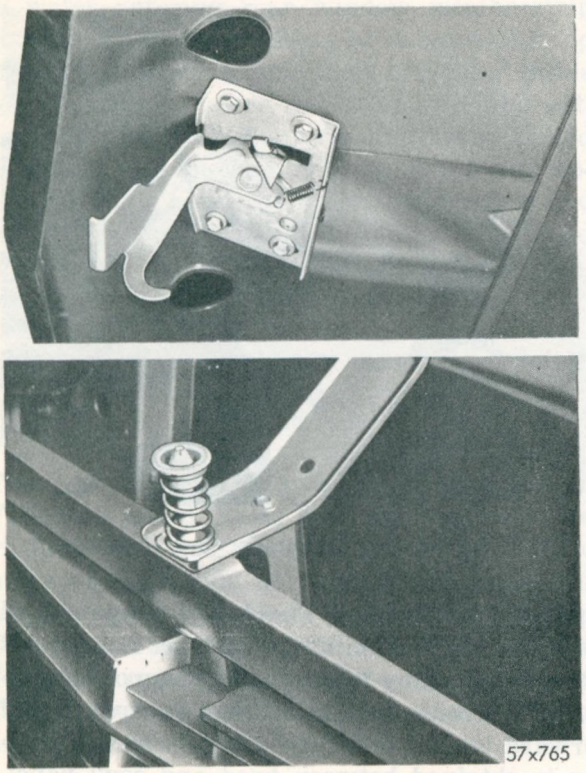


Fig. 15—Striker Plate Adjustment (Hood)

correct at front pillar. Also, check to see if front of fender is flush with front of hood. When correct fitting has been obtained, tighten bolts previously loosened and remove tool.

Adjustment of Hood Striker and Lock Assembly (Fig. 15)—The hood striker is mounted on a plate which is attached to the underside of hood. The bolt holes in plate are elongated to allow striker to be adjusted fore-and-aft. The hood lock plate is fastened by five bolts, in slightly oversized holes, which will allow lock plate to be shifted slightly in any direction. The striker stud and spring assembly is located on outer panel and is adjustable. To adjust striker (to lengthen or shorten), loosen lock nut, turn striker in or out with screwdriver until correct adjustment has been obtained. **After making any adjustment that requires shifting of hood or fender, always check hood striker for proper length, and lock plate assembly for alignment.**

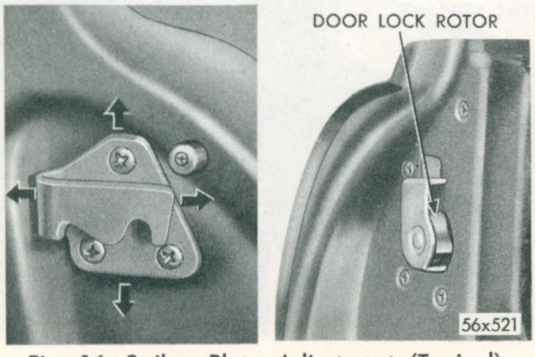


Fig. 16—Striker Plate Adjustment (Typical)

After hood has been centered in opening and hinge bolts have been tightened, check hood for ease of opening and closing. Move striker plate in or out, up or down, as necessary, until hood opens and closes easily, and fits snugly against weatherstrip. Make sure top face of striker plate is parallel with bottom face of hood guide block. This prevents hood rattles when car is in motion.

6. FITTING DOORS (Fig. 16)

Make thorough inspection of door before attempting adjustment. A properly fitted door has evenly spaced gaps on all sides. Check engagement of door latch with striker plate. If door raises as latch passes over plate, plate is too high and must be lowered. The striker plate, as shown in Figure 16, can be moved "In" or "Out" and controls the tightness of door against body. The "Up" and "Down" adjustment will determine actual point of engagement between door lock rotor and lower portion of striker

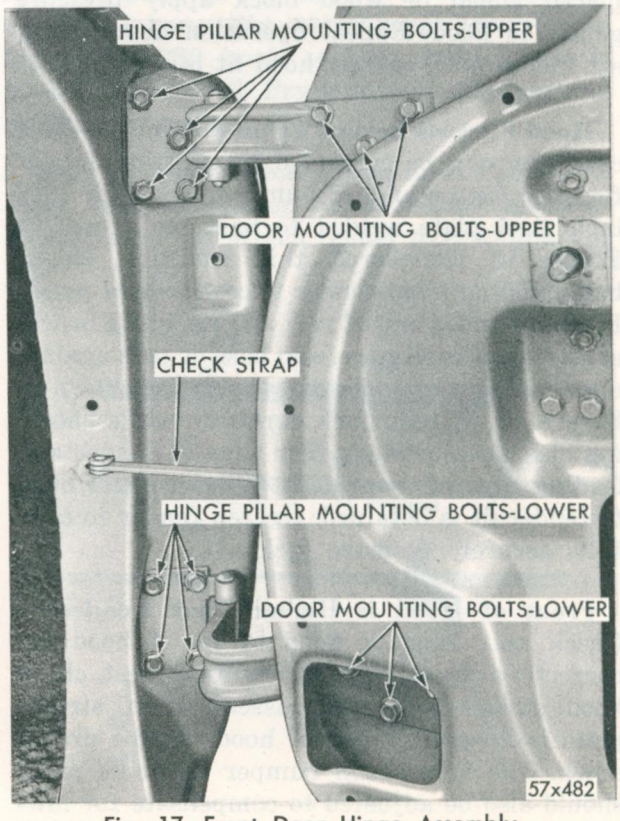


Fig. 17—Front Door Hinge Assembly

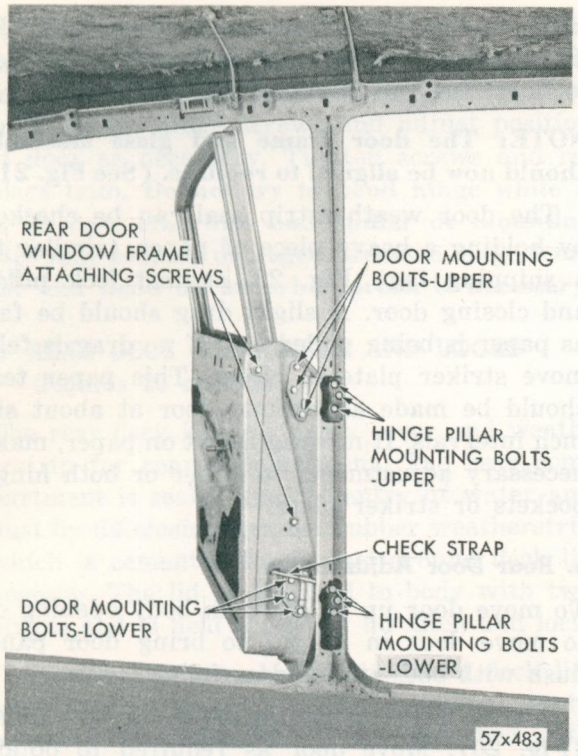


Fig. 18—Rear Door Hinge Assembly

plate. After door has been fitted properly to opening, adjust striker plate as necessary.

a. To Raise or Lower Door (Front Doors) (Figs. 17 and 18)

To raise or lower door, place jack under door as near hinge as possible. (This will hold weight of door as hinge bolts are loosened). The amount of vertical movement is limited; however, the amount of movement can be determined by scribed line previously made. Raise or lower jack until desired clearance is obtained. Tighten hinge bolts securely. **Check scribe lines to make certain rear portion of door did not move forward or rearward during above operation.**

b. Moving Door Ahead or Back (Front Door)

Moving door ahead or back is accomplished by loosening either upper or lower hinge bolts. (See Fig. 19). To move upper portion of door ahead or back (trim panel removed), loosen upper hinge strap bolts and either pull or push upper portion of door in desired direction. Tighten hinge strap bolt and check fit. To move lower portion of door ahead or back (trim panel removed), loosen lower hinge strap bolts and either pull or push lower portion of door in desired direction. Tighten hinge strap bolts and check fit. When correct, reinstall door trim panel.

c. Fitting Front Door Flush with Adjacent Panels

If door is not flush with adjacent panels, correct by loosening four hinge strap screws (on front doors or three hinge strap screws on rear doors).

It should be remembered that when loosening upper hinge and pulling "out" or pushing "in" on front corner of door, lower corner of door will be moved inward or outward also. The opposite corners of door will also be affected in a similar manner when lower hinge is moved "in" or "out". This applies to both front and rear doors. If, after making hinge adjustments as described above, upper portion of door is still out too far, open door ventilating wing and door glass. With Tool Model "G" Double Bar Unit, bend door to its correct position. If door is sprung or bowed out at center, mount Tool Model "H" Single Bar Unit. Tighten lower clamp to force door back to original position. After using Bar Units, check door for proper fit and ease of window operation.

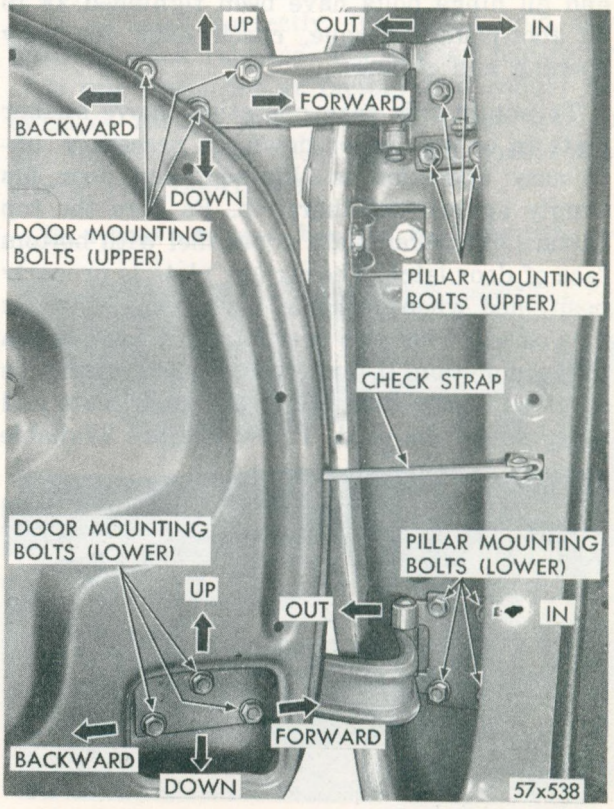


Fig. 19—Adjusting Door Hinges (Front)

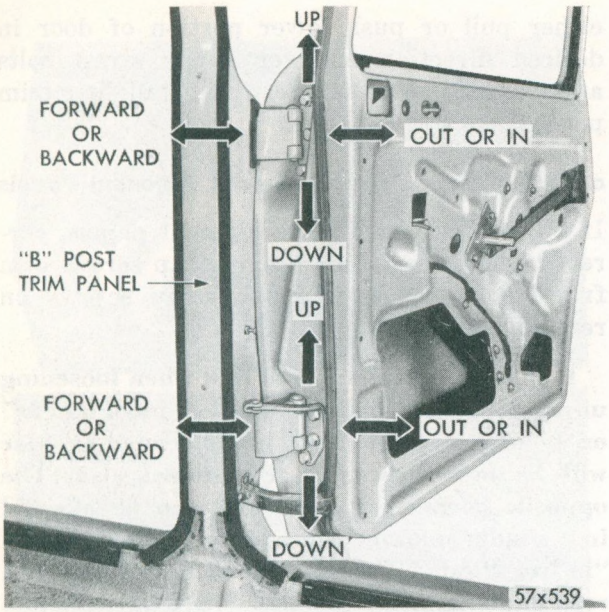


Fig. 20—Adjusting Door Hinges (Rear)

d. Striker Plate Adjustment (Fig. 20)

NOTE: Front and rear door glass window frames are removable and should not be adjusted or aligned to roof line until doors and striker plates are properly adjusted.

After door has been centered in its opening and all hinge bolts have been tightened 18 to 20 foot-pounds torque, check door for easy opening and closing.

To obtain this easy operation, move striker plate in or out, up or down, as necessary, until easy operation is obtained, and door fits snugly against weatherstrip. Be sure the top surface of striker plate is parallel with bottom face of door latch. The striker plate is properly positioned when door has a very slight lift as it is closed. This also prevents door noise when car is in motion. If proper adjustment cannot be obtained, use of shims between latch plate and pillar should be used. The shims are available in $\frac{1}{32}$ and $\frac{1}{16}$ inch thickness, through MOPAR. The shims are used to bring latch plate closer to door, for full engagement.

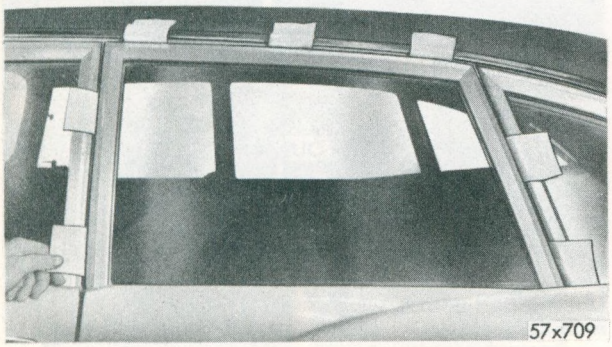


Fig. 21—Checking Seal of Door

NOTE: The door frame and glass assembly should now be aligned to roofline. (See Fig. 21)

The door weatherstrip seal can be checked by holding a heavy piece of paper (similar to a shipping tag) Fig. 22, against lock pillar and closing door. A slight drag should be felt as paper is being pulled out. If no drag is felt, move striker plate in closer. This paper test should be made all around door at about six inch intervals. If no drag is felt on paper, make necessary adjustments to either or both hinge pockets or striker plate.

e. Rear Door Adjustments

To move door up or down in body opening or to move door in or out to bring door panel flush with body, proceed as follows:

Loosen hinge attaching bolts at "B" pillar (Fig. 20). Move door as required to obtain proper fit with door opening. Tighten bolts securely. To move door toward rear of car; shims may be installed between hinge and pillar or between hinge and door.

7. FRONT DOOR HINGE ADJUSTMENTS

The screw holes are slotted horizontally so that door or hinge can be shifted in or out about $\frac{3}{8}$ inch. To make a vertical or fore-and-aft adjustment, remove inside door hardware and trim panel. After adjustment is accomplished, hold door in adjusted position and secure hinges by tightening hinge screws.

8. REAR DOOR HINGE ADJUSTMENTS (Fig. 20)

Hinge mounting holes are oversize and slotted

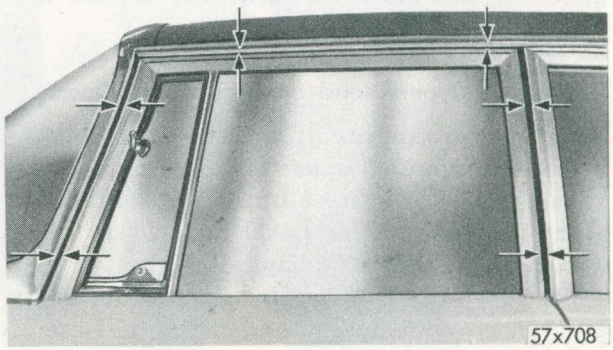


Fig. 22—Aligning Upper Door Glass Frame to Hoodline and Rear Door

to allow for up and down or in and out movement on pillar post. If hinge is mounted to reinforcement panel **inside** door, remove door trim, loosen hinge screws and adjust position of door as necessary. Tighten screws and replace trim. **Do not try to bend hinge while it is on car; otherwise body pillar or mounting face may become damaged. Remove hinge from car and bend on an arbor press, if necessary.**

9. REAR DECK LID, HINGES AND LOCKS (Figures 23 and 25)

The rear deck lid provides a cover and weatherstrip for rear compartment. The rear compartment is sealed against entry of water and dust by lid closing against rubber weatherstrip which is cemented to channel around deck lid opening. The lid is attached to body with two hinges and is held closed by lid latch and lock.

All Chrysler cars have a balanced deck lid, made possible by a new torsion bar hinge mechanism. Lifting deck lid is accomplished with a finger tip—the weight of heavy lid is counterbalanced in all positions by spring tension of two torsion bars. (See Fig. 23). The torsion bars are long, small diameter steel bars, that are free at one end and anchored to support bracket at other. (See Fig. 24). A roller sleeve on free end, operates against a "cam Contour" on back face of hinge. As deck lid is raised, action of rollers against hinges cause bars to twist, exerting a torsional spring resistance that balances lid. To permit adjustment of torsion bar tension, four slots are located in each support plate, on Imperial Models, and three

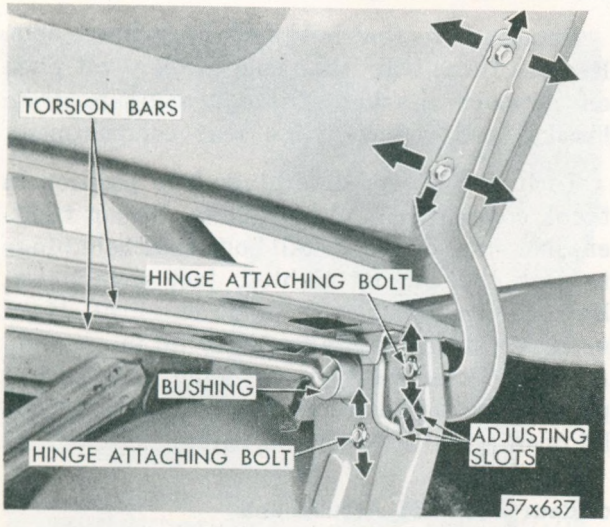


Fig. 23—Torsion Bar Hinge Mechanism

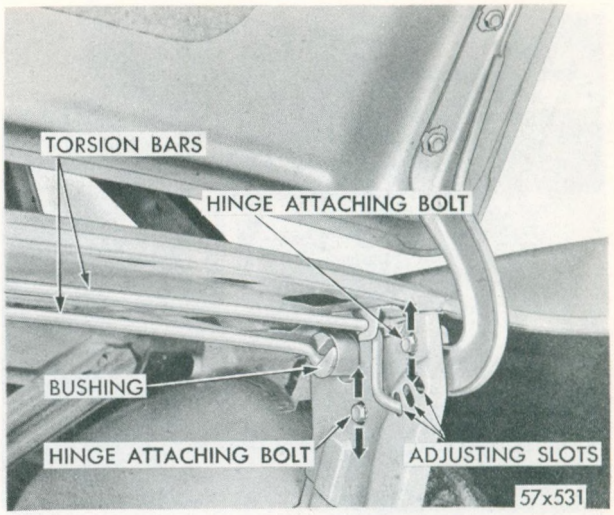


Fig. 24—Deck Lid Torsion Bar

slots are located in each support plate on Chrysler Models, as shown in Figure 25. To adjust rod tension, insert slot in Tool C-3445, behind lower rod, roll tool forward to disengage lower rod from bracket.

Be sure to prop deck lid in wide open position before changing adjustment, to avoid personal injury in case lid should drop. Bend rod toward front of car to lessen tension and toward rear to increase tension. When lid has been adjusted correctly, lid should hold any position when released. The torsion bar roller ends are lubricated at factory and should require no further lubrication. If a new torsion bar, however, has been installed, coat roller sleeve with Lubriplate.

To remove torsion bar for replacement, re-

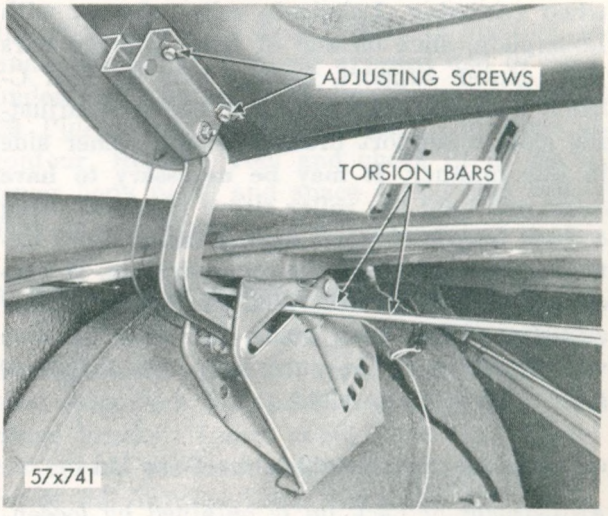


Fig. 25—Rear Deck Hinge Assembly (Imperial)

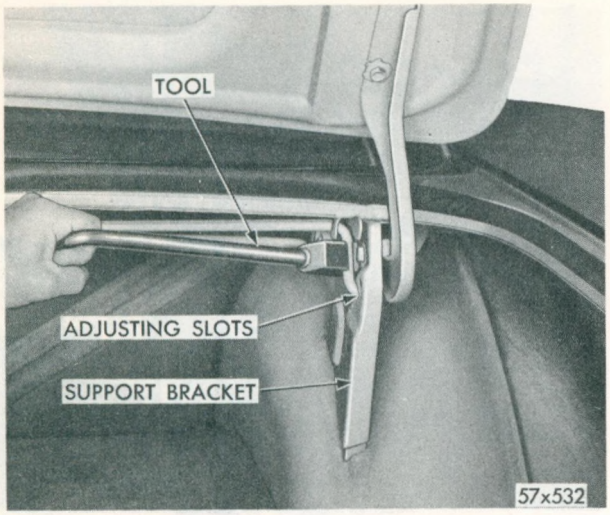


Fig. 26—Adjusting Torsion Bar

fer to Figures 23 and 25, and proceed as follows:

Support deck lid with suitable prop, disengage bars from adjusting slots, using Tool C-3449, as shown in Figure 26.

CAUTION

Use extreme care when removing bars as tension will cause them to "unwind" suddenly.

Slide bars out of center support bracket and slide bar in opposite direction to disengage roller from hinge. Disengage rod from support bracket, and remove. To install torsion bars, refer to Figures 23 and 25 and proceed as follows:

Slide bar into position in same manner as when removing. Lubricate roller sleeves with Lubriplate, slide on end of bars. Engage bars with center support, engage slot in Tool C-3449, with bar, and force bar end into adjusting slot in support bracket. Install other side in like manner. **It may be necessary to have some one hold the roller sleeve in place, using a short length of wood during installation.** Remove prop and check lid for operation. If necessary, adjust as described previously. After adjustment has been made, tap ends of bars with hammer to be sure they are fully engaged in adjusting slots.

a. Removing and Installing the Deck Lid

Adjustment of deck lid is obtained by loosening bolts and shifting lid from side to side or front to rear. It is often possible, however, to properly fit deck lid by adjusting striker plate, latch or both. Should it become necessary to remove deck lid for replacement or repair, refer to Figure 24, and proceed as follows:

Raise deck lid and remove one of two bolts in each hinge that attach lid to hinge arm. (Leave remaining two bolts finger loose).

Brace deck lid in such a manner so as to hold lid in position while removing last two bolts. (This will keep lid from sliding down and damaging rear deck). Remove last two bolts and lift deck lid up and away from rear of car.

When installing deck lid, observe same precaution. Lift lid and slide down into position, install attaching bolts. Do not tighten, just snug down. Lower lid and check fit. If necessary, adjust lid, check adjustment of latch and striker plate.

b. Removing and Installing Deck Lid Hinges

The deck lid hinge upper mounting flange is fastened to deck lid by two bolts at each hinge. The bolt holes are slotted and slightly oversize to permit fore-and-aft and lateral adjustment of deck lid.

Should it become necessary to remove and install either of rear deck lid hinges, for repair to complete replacement, refer to Figures 24 and 25 and proceed as follows: Raise deck lid and brace lid on corner where hinge is to be removed. Remove torsion bar from side on which hinge is to be removed. (Remove torsion bar as described previously.)

Remove bolts that hold deck lid to hinge arm. Remove three bolts that hold hinge pivot plate on support bracket. Disengage hinge from bracket and remove from rear compartment.

To install hinge, slide hinge into position in trunk compartment, install bolts. Do not tighten, just snug down. Install bolts that hold hinge to deck lid. Do not tighten, just snug down. Remove prop and lower lid to check fit. Make necessary adjustments to center lid in opening. Also, check adjustment of latch and striker plate. After adjustments have been made prop lid open and install torsion bar.

c. Rear Deck Lid Adjustments

The deck lid hinges, lock and striker plate are

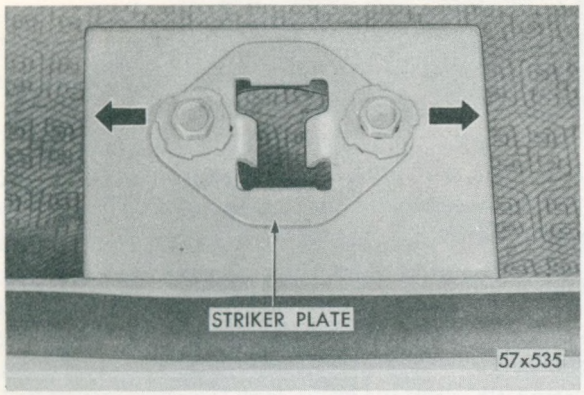


Fig. 27—Adjusting Striker Plate (Rear Deck)

adjustable (Fig. 27), enabling a proper fit of deck lid with little effort.

d. Centering Deck Lid in Opening

The two bolt holes in each of deck lid hinges are oversize, thereby permitting lid to be moved ahead or back, and from side to side. When positioning, locate lid so extreme rear portion along sides are both flush with body panel as well as equally spaced in opening. To adjust, loosen hinge bolts (one hinge at a time) as shown in Figure 24. Move lid in desired direction, retighten bolts. Repeat this operation on opposite side until lid fits flush with body panel all around.

e. Correcting Deck Lid Contour

Incorrect contour of deck lid should not be confused with deck lid being improperly located on its hinges. The lid spacing across top must be uniform but at same time, must be

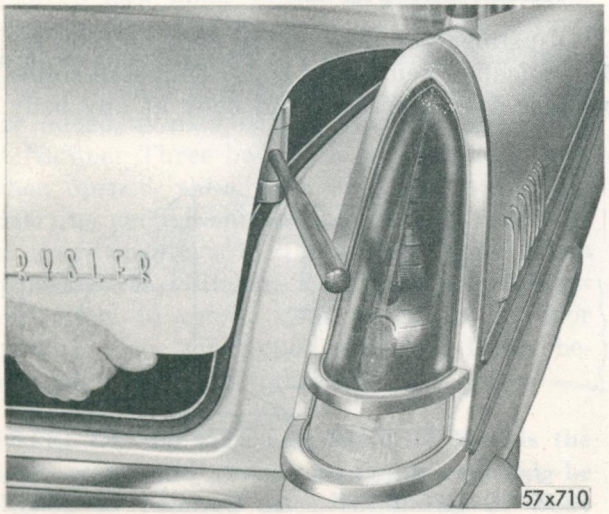


Fig. 28—Increasing Rear Deck Lid Contour

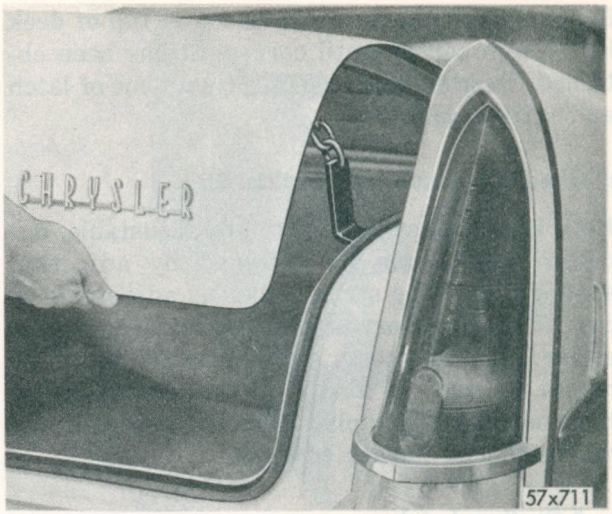


Fig. 29—Decreasing Rear Deck Lid Contour

flush with rear body quarter panels. The lid contour can be increased or decreased a slight amount by bending, but when doing so, space across top of lid is also increased or decreased. For instance, if contour were increased, lid would become shorter whereas, if contour were decreased, lid would become longer. Each time lid contour is changed, in all probability lid would have to be relocated on hinges.

f. To Increase the Deck Lid Contour

Insert rubber mallet between lid and quarter panel, as shown in Figure 28, then apply pressure on lower corner of lid. Remove mallet and check fit and flushness at rear of deck lid. Readjust lid on hinges, if necessary.

g. To Decrease Deck Lid Contour

Insert large end of Tool C-3011 in opening of underside of lid, hooking exposed end of Tool under rear quarter panel, as shown in Figure 29. Pull out on rear end of deck lid to decrease contour. Remove Tool and check fit of lid at lower body panel and space across top. Readjust lid on hinges if necessary.

h. Raising or Lowering Upper Corners of Deck Lid

To Raise—If either of upper corners are too low, open deck lid and loosen bolts that hold hinge bracket. Insert small fiber block under low corner between lid and side panel. Slightly lower lid. Tighten bolts and check fit.

To Lower—Raise deck lid and loosen bolts as

in paragraph above. Press down on top of deck lid at high corner until correct fit has been obtained. Tighten bolts, check adjustment of latch and striker plate.

i. Checking Latch and Striker Plate

Both latch and striker plate are adjustable, but better results can be obtained by adjusting striker plate. The striker plate is adjustable in two directions, forward and backward, and to either side, as shown in Figure 30. As plate moves to rear, it also rises making it easier to close lid. Moving plate forward lowers it and makes the lid harder to close.

j. Adjusting Latch

Loosen three bolts, as shown in Figures 27 and 30, and move latch into proper engaging position. Tighten bolts securely.

When adjusting latch, care must be taken to be sure latch is not moved away from push button latch release. If this happens, lid will not open.

k. Checking for a Correctly Fitted Deck Lid (Fig. 31)

A correctly fitted deck lid is one that is centered in opening, and fits flush with body panels. A check for proper fitting and seal of deck lid can be made with strips of paper. Insert strips of paper (about an inch wide) along edge of deck lid opening, close lid. (See Fig. 31). If papers fit snug all along edges of lid as they are pulled out, a good seal is evident. If paper fits loosely on one side, and tight on other, deck lid should be aligned.

10. BODY ALIGNMENT

When checking alignment of body that is badly damaged, frame should be inspected and necessary repairs, if any, made to frame before taking measurements for squaring up of body. The door and other glass should be removed to prevent breakage. Reinforcement brackets and other construction parts may have to be removed to permit restoration of outer shell and pillars to prevent excessive strain on parts during and after repairs. If such parts must be removed to be straightened and aligned, they must be reinstalled and secured in place before attempting to align body.

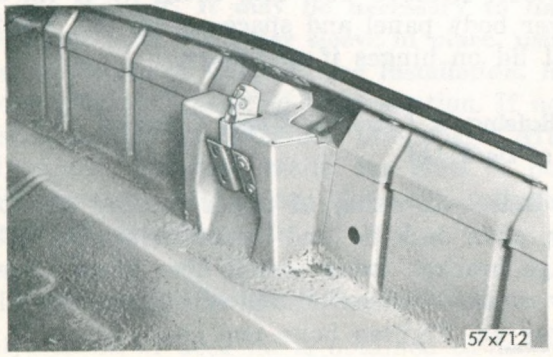


Fig. 30—Adjusting Rear Deck Lid Latch (Imperial)

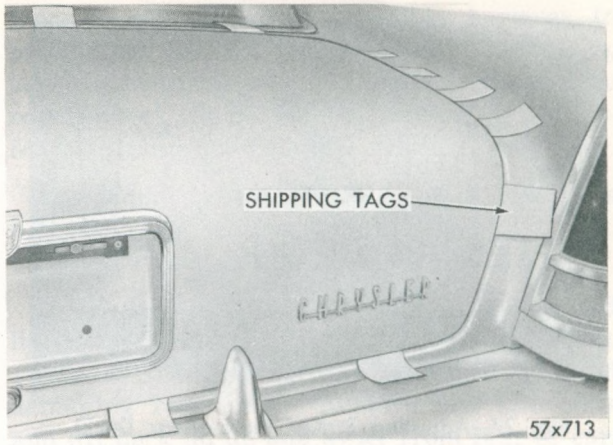


Fig. 31—Checking Seal of Deck Lid

In cases where it may be necessary to use heat, part should be heated in area of damage. Parts should never be heated more than a dull red. Any attempt to cold-straighten a severely bent part may cause ruptures or cracks which may weaken the part structurally.

11. SHIMMING THE BODY FOR DOOR ALIGNMENT (Fig. 32)

If adjustment of door hinge does not correct door misalignment, shim body. To install shims between frame bracket and body at any body

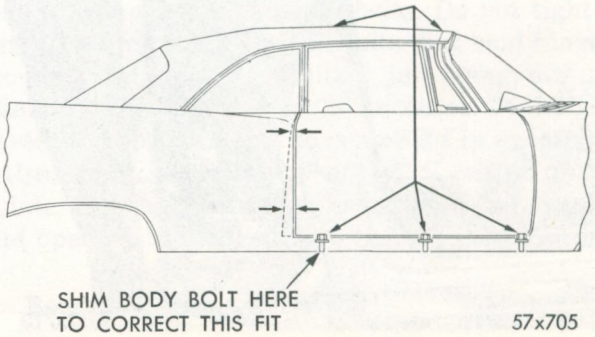


Fig. 32—Shimming Body for Door Alignment

mounting bolt, loosen all body bolts on that side. Place a 2 x 4 or fiber block on a floor jack and raise body slightly at location to be shimmed. Add sufficient number of shims to correct misalignment. After inserting shim at any one body bolt, be sure adjacent body bolts are shimmed to support body on straight line contour. When shims are inserted, barely tighten down body bolts and check door alignment before tightening bolts to specified torque. In some instances, shims may be removed to correct door misalignment. If front door is high at rear edge, remove shims from the Number Two body bolts. Excessive shims on the Number Four body bolt will be indicated at rear door binding at bottom.

a. Body Mounting Bolts

The body mounting bolts (except four at rear) are accessible from under car. The four at rear are accessible from luggage and rear compartment. On Town and Country models, pry out plug in floor of rear compartment near tirewell to reach bolt.

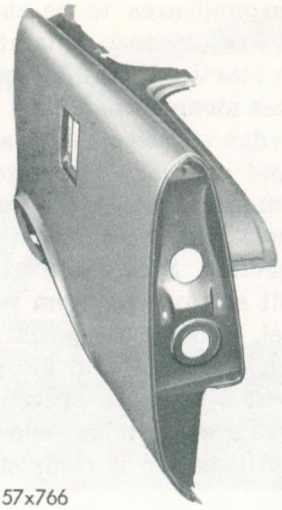
b. Body Mounting Bolt Torque Specifications

Tighten body mounting bolts on all models, except Convertibles, 18 foot-pounds torque. Tighten front body mounting bolt on Convertible 18 (minimum) to 20 foot-pounds torque. Rubber insulators should be compressed 1/8 inch (visually) when body bolt is tightened.

c. Conditions Requiring Body Shimming

If rear door binds near top of lock pillar and spacing is correct at hinge pillar, shim at Number four body bolts. Add shims until spacing between lock pillar and rear door is same as between door and hinge pillar. Check adjustment by opening and closing door to determine if interference is eliminated. If several shims are added, it may be necessary to add shims at Number Three body bolt. If rear door sags when opened, shim Number Three body bolt, inserting enough shim to center door vertically in door opening. If front door sags when opened, shim Number Two body bolt, inserting shims to center door vertically in door opening. Door must open and close freely before body bolts are tightened.

NOTE: On the C-76 and Imperial Models the door glass and frame assembly should be aligned to roofline after shimming of body bolts.



57x766

Fig. 33—Body Panels (C-75, C-76)

12. BODY PANEL REPLACEMENT

The rear fender is an integral part of quarter panel and cannot be separated. This does not necessarily mean that part of panel cannot be replaced. With proper equipment, an experienced body repair man can replace rear fender or quarter panel or part thereof, by following procedures: (Figs. 33 and 34).

Rough out and reshape as much of damaged area as is possible. Measure piece of metal to be cut out. Measurements should be taken from a given point, such as moulding, bead, corner, or "A" post. Make corresponding measurements on repair panel; for accuracy, make sure measurements are taken from same points on each panel.

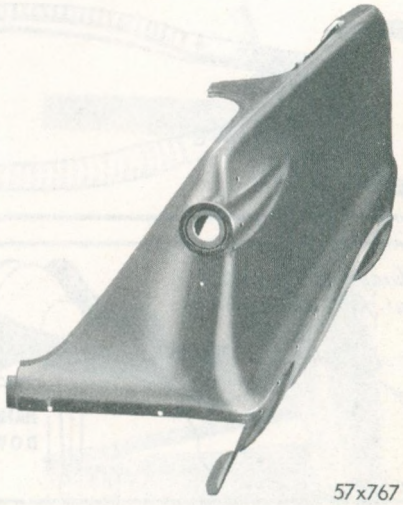


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Fig. 34—Body Panels—Imperial

Scribe line around area to be cut from repair panel and drill ¼ inch hole at corner of scribed line, as starting point for cutting, and cut out new piece along scribed line. Straighten out and finish edge of piece that was cut from repair panel and use as a template to scribe line around damaged area. After scribing line, drill ¼ inch hole and use suitable tool to cut out damaged section. Straighten out cut edge of panel, and fit section cut from repair panel into body panel, making sure that edge does not overlap. Tack-weld section in spots, about 6 inches apart at a time (to prevent excessive distortion) make a continuous weld around repair section, until section is completely welded into place. Hammer weld approximately ⅛ inch below contour of original surface. Metal-finish area; fill area with solder, taking care that sufficient solder is applied so that final metal finish will compare with original body, fender, or panel contour without indentations and prepare for painting. The same procedure can be followed when replacing other sections of body.

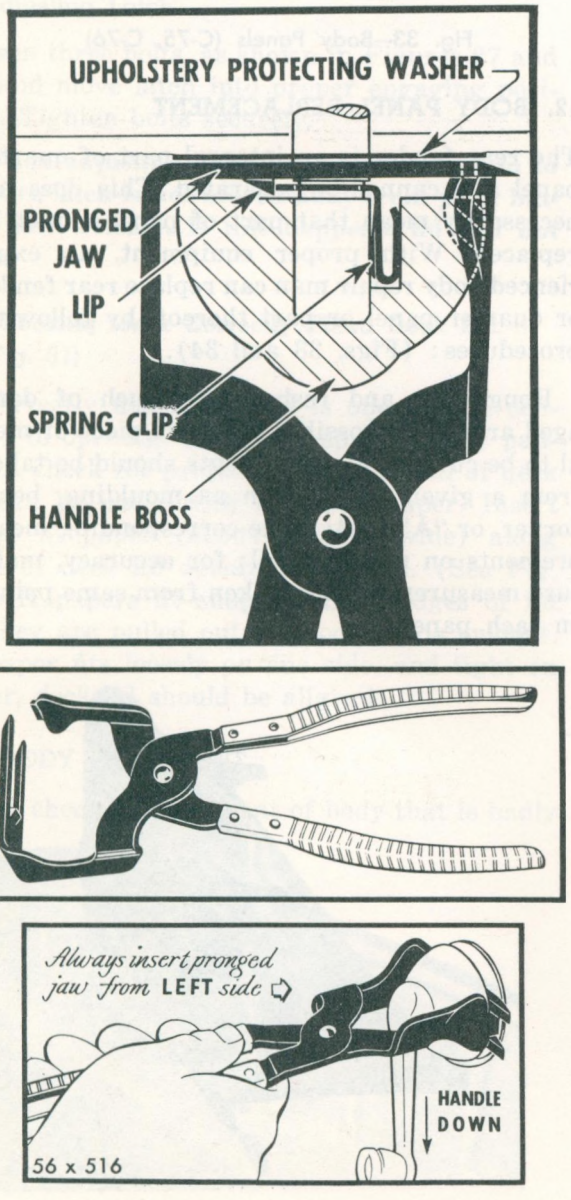


Fig. 35—Regulator Handle Removing Tool

Fig. 36—Removing Door Trim Panel

13. REMOVAL AND INSTALLATION OF DOOR AND WINDOW REGULATOR HANDLES
(Cars without Electric Window Lift)

The door and window regulator handles are attached to regulator with a spring type clip. Refer to Figure 35 and insert the pronged jaw of tool between handle and washer, with handle in down position. This will keep handle from cocking and binding on shaft. Squeeze handle of tool together after making sure tool is in proper position and remove handle.

When installing handle, make certain concave side of washer is facing outward and handle is in downward position. Slide handle over shaft and press it on until clip engages locking groove on shaft. On cars equipped with Electric window lift, remove remote control handle, as outlined in Paragraph 19.

14. REMOVAL AND INSTALLATION OF DOOR TRIM PANEL
(Cars without Electric Window Lift)

Remove door and window regulator handles, garnish moulding, (if so equipped). Starting at lower corner of panel, (Fig. 36) work panel

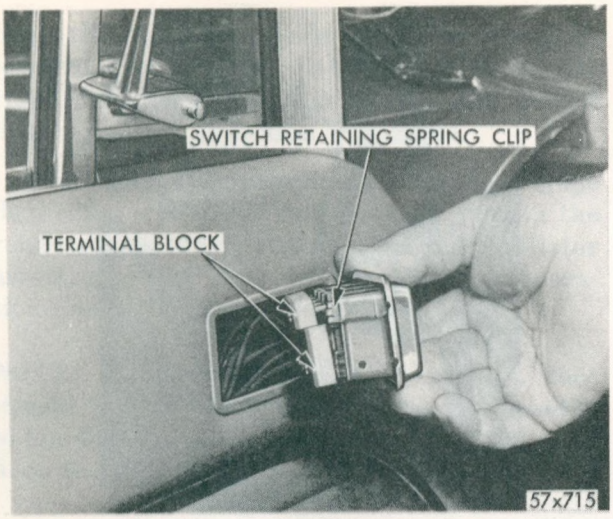


Fig. 37—Removing or Installing Door Glass Control Switch

out from door. (Screwdriver can be used in operation if necessary).

When installing panel, make sure all clips are secured in place and install panel in position on door. Force each clip into position with palm of hand. Install garnish moulding, arm rest and handles.

NOTE: On models equipped with Electric window lift, including Imperial and C-76 models, remove switch and terminal block (Fig. 37). Remove trim panel and arm rest assembly.

15. REMOVAL AND INSTALLATION OF REAR DOOR WINDOW LIFT REGULATOR (Cars without Electric Window Lift)

Remove garnish moulding, remote control handles, arm rest and door trim panel assembly. Remove trim panel and weatherproof lining. Avoid tearing weatherproof lining. Remove door glass and window regulator attaching screws (see Fig. 38) and slide regulator assembly out through large opening at bottom of door.

When installing new regulator assembly, be sure that gear teeth and gear are liberally coated with MOPAR Lubriplate, and that weatherproof lining is securely cemented to door.

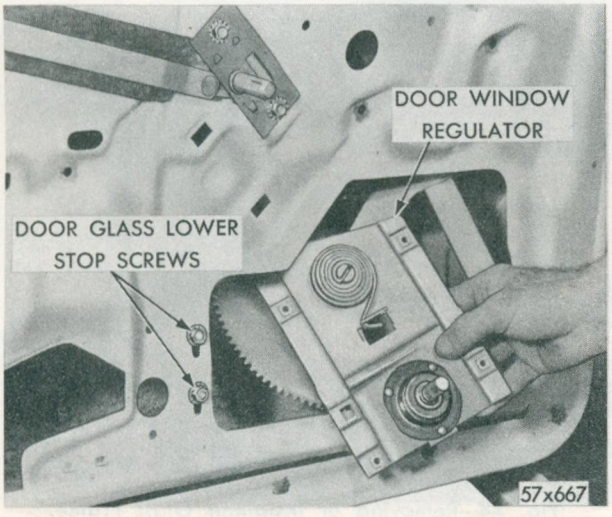


Fig. 38—Removing or Installing Rear Door Regulator

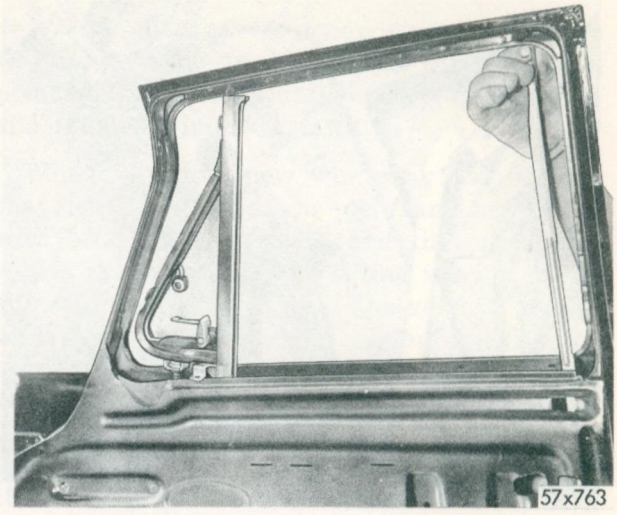


Fig. 39—Replacing Glass Run Channel

16. REPLACING GLASS RUN CHANNEL (Cars without Removable Frame Assembly)

Work lower portion of door trim panel away from door to facilitate disengaging lower end

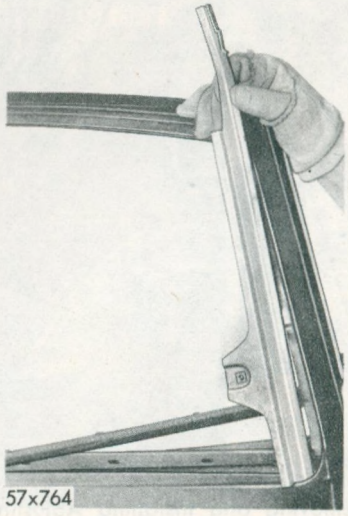


Fig. 40—Removing Glass Run Channel

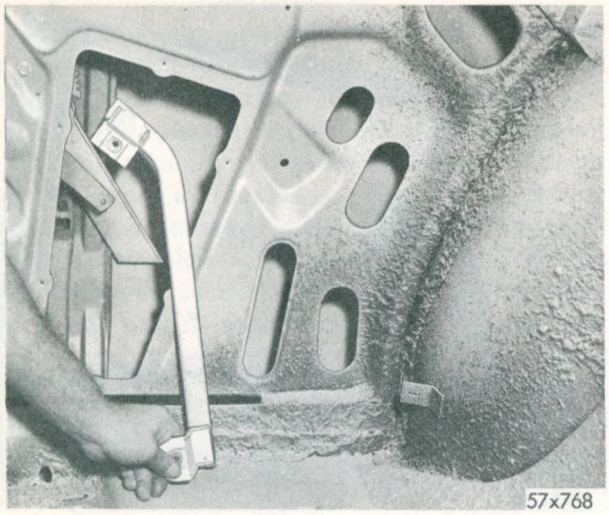


Fig. 41—Installing Glass Run Channel

of channel from support. Lower door window and loosen garnish moulding screws and disengage upper section of channel, as shown in Figure 39. Disengage end of glass run from ventilation window division bar, and pull the glass run channel down from top. Pull remaining portion of run up and out of door, as shown in Figure 40.

When installing new glass run channel, use old run as pattern for length and curved portion. Install by sliding vertical length into door to the curve (see Fig. 41) and across top. Engage with ventilator window division bar, raise door window glass, and engage lower end of run in channel. Tighten garnish moulding screws and reinstall trim panel and arm rest assembly.

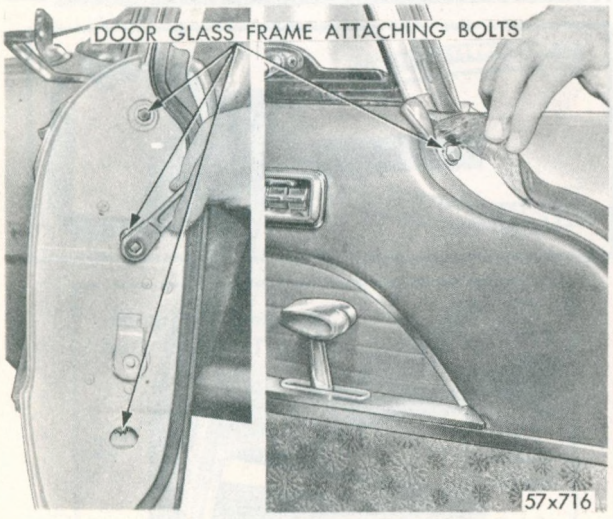


Fig. 42—Removing and Installing Adjusting Frame and Glass Assembly

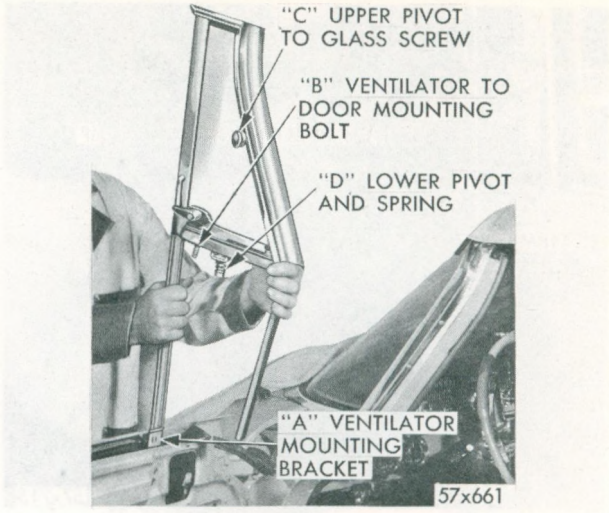


Fig. 43—Removing Ventilator

NOTE: To replace glass run channel, front ventilator assembly and window glass, refer to Figure 42. Remove frame to door attaching screws and frame and glass assembly.

17. REMOVAL AND INSTALLATION OF DOOR VENTILATOR ASSEMBLY (Cars with Removable Glass Frame Assembly)

Remove garnish moulding, remote control handles, arm rest (if so equipped), and door trim panel. Remove screws that attach ventilator window to door frame, as shown in Figure 42. One screw is on front face of door. Remove bolt holding division bar (anchor) of ventilator window to inside door panel. Lower front door window glass against its bottom stop. Slightly twist ventilator window and, at same

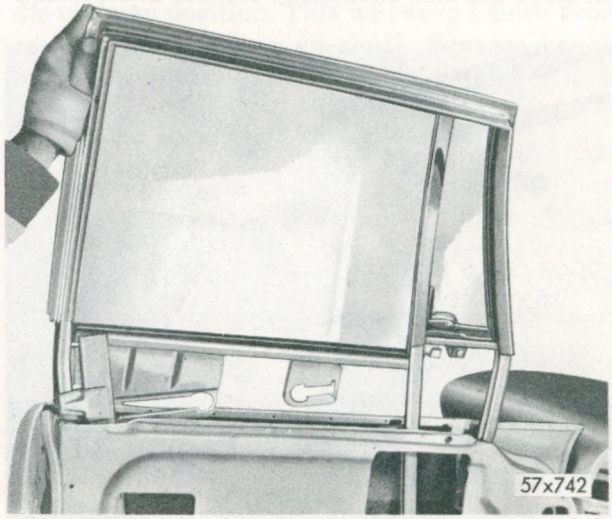


Fig. 44—Removing or Installing Glass Frame, Glass and Door Ventilator Assembly

time, tilt it toward inside of car to disengage lowered door window glass from division bar run. Slide ventilator window up and out of door panel, as shown in Figure 44.

When installing ventilator window, engage door glass with division bar as outlined in the removal procedure. After installing ventilator assembly, check door window glass for operation and adjust as needed.

NOTE: On Imperial and C-76 models, care should be taken to align glass frame assembly to hoodline and door opening (Fig. 22). Check door for proper sealing (Fig. 21).

18. REMOVAL AND INSTALLATION OF DOOR GLASS (Cars without Removable Door Glass Frame Assembly)

Remove garnish moulding, inside door handles, arm rest, and trim panel assembly. Remove trim panel and weatherproof liner. Avoid damaging liner. Remove glass run and screws that hold lower window stop to door panel and remove stop.

Lower window far enough to facilitate disengagement of regulator arm pivot roller. Raise window and tilt glass inward until glass clears to raise window until the other regulator arm pivot roller clears door. Disengage pivot arm and remove window glass.

When installing new window glass, be sure that slots in bottom of channel frame are coated with MOPAR Lubriplate and that the pivot rollers are free. After installing window glass, adjust division bar so that the vertical sliding glass does not bind when window is raised or lowered. Align door glass and frame assembly and check door seal as indicated in Paragraph 6 (Fig. 21 and 22).

19. REMOVAL AND INSTALLATION OF DOOR LATCH AND REMOTE CONTROL (Fig. 45)

Remove garnish moulding, trim panel and arm rest assembly, and remote control handles. Remove screws holding remote control base to door panel. Raise window and bend bottom catch of window felt run channel outward (toward center of door). Work door latch and remote control assembly out through opening in door.

When installing remote control assembly, coat all parts with MOPAR Lubriplate. Install

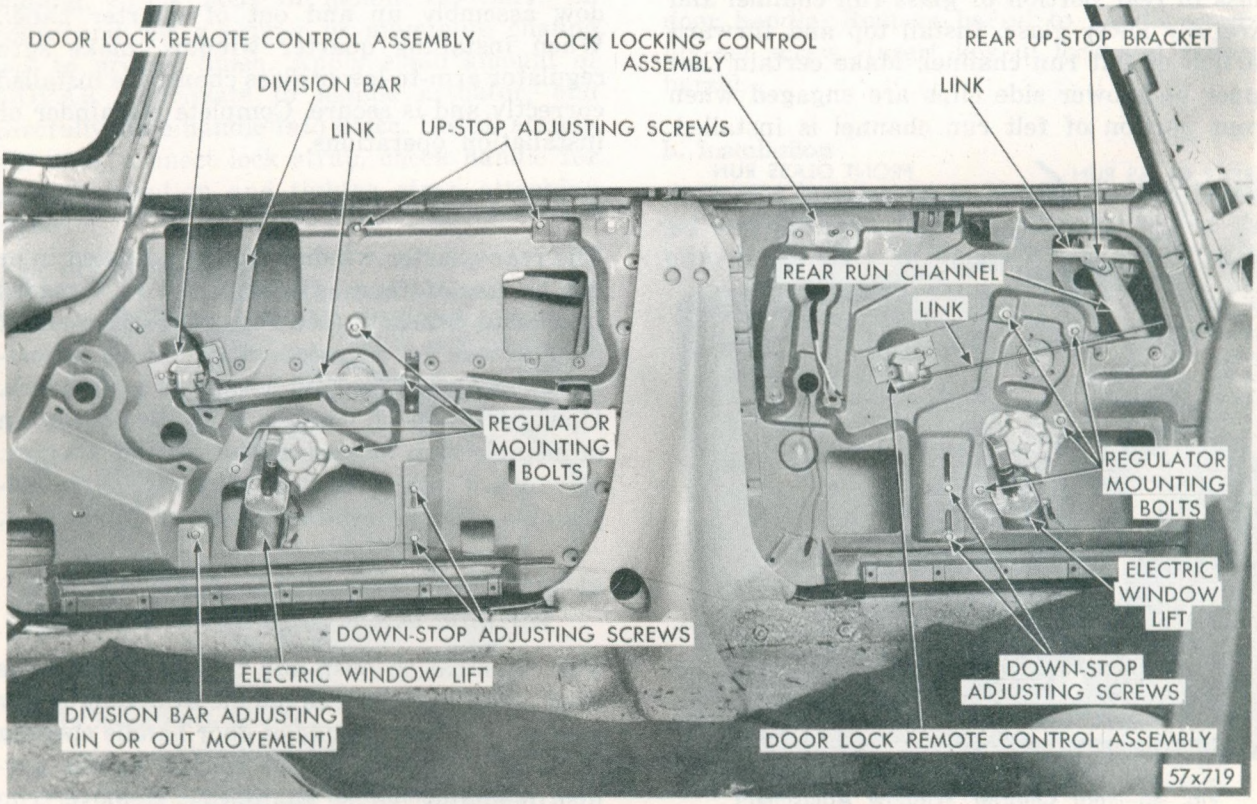


Fig. 45—Front and Rear Door Control Assembly

assembly through opening in door and secure with attaching screws. Bend bottom catch of window felt run channel inward and install cap screws holding remove control base to door panel. Check the assembly for proper operation. Install trim panel, garnish moulding, and door handles.

20. REMOVAL AND INSTALLATION OF QUARTER WINDOW GLASS (Special Club Coupe and Convertible Coupe Models)

a. Special Club Coupe

Refer to Figure 46 and proceed as follows: Remove rear seat cushion, regulator handle, and trim panels. Lower glass and remove Allen screw locking pivot arm pin. Pull forward vertical section of felt run channel up and out of body opening. Carefully raise glass and disconnect regulator arm from quarter glass lower channel. Remove glass from opening. If glass is to be replaced, drive the seal and channel off glass with hardwood block and mallet.

When installing quarter window, slide seal and lower channel on glass. Wind regulator arm up until the end protrudes above window opening. Connect arm to lower channel. Guide glass in rear portion of glass run channel and carefully lower glass. Install top and forward portion of felt run channel. Make certain that upper and lower side clips are engaged when front portion of felt run channel is installed.

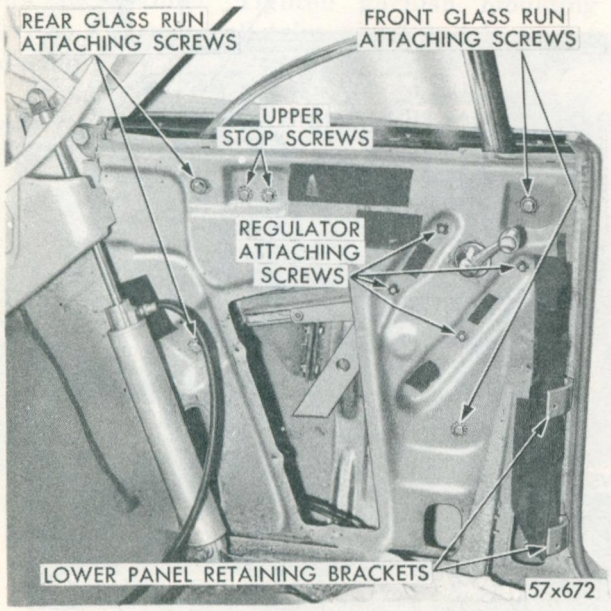


Fig. 46—Rear Quarter Window Adjustment (Club and Convertible Coupe)

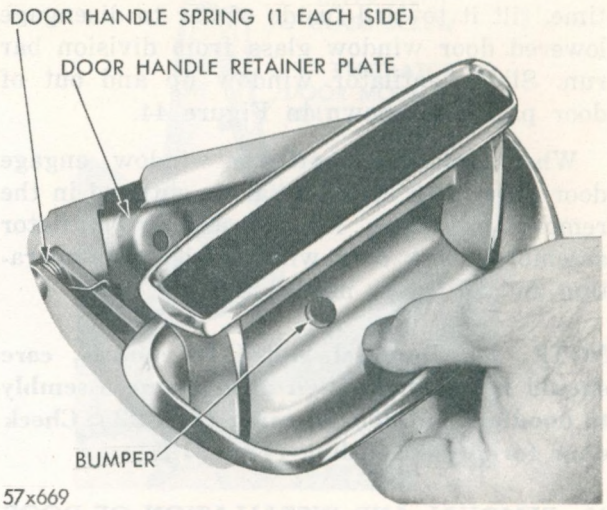


Fig. 47—Removing or Installing Door Handle

Refer to c., below, for adjustment of rear quarter window. Install trim panel and the other components that were removed.

b. Convertible Coupe

Lower top, position quarter window, and remove retainer and washer that holds regulator arm to lower glass channel. Remove pivot bracket hinge screws, (see Fig. 46). Work window assembly up and out of quarter panel. When installing quarter window, make sure regulator arm-to-lower glass channel is installed correctly and is secure. Complete remainder of installation operations.

c. Adjustment of Rear Quarter Window

The rear quarter window can be adjusted in or out by use of four adjusting screws threaded into pivot bracket, (see Fig. 46). The rear of window can be adjusted in or out by adjustments located at top and bottom of guide track. Upward travel of window is controlled by an adjustable stop located at the rear of window. Downward travel is controlled by a non-adjustable stop in reinforcement of pillar post.

21. REMOVAL AND INSTALLATION OF OUTSIDE DOOR HANDLE (All Models)

The combination push-pull type door handle is used on all models. The handle attaching screw is accessible from inside of door handle opening (Fig. 47). Remove remote control handle garnish moulding (if so equipped). Remove trim panel and arm rest assembly. Remove lock as-

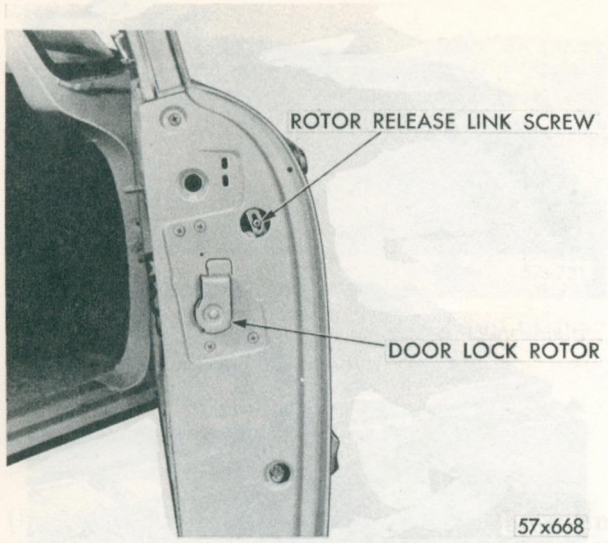


Fig. 48—Door Lock Rotor Release Link Attaching Screw

sembly attaching screws. Remove access plug in door (Fig. 48) and remove handle to lock attaching link screws. Lift door handle slightly, and slide handle from door opening, as shown in Figure 47. Assemble handle, trim panel components and remote control handle in the reverse of disassembly.

Do not damage finish of handle when installing. Check body of handle for burrs on edges and use a copper or aluminum chafing pad to protect finish. Apply small amount of MOPAR Lubriplate to handle actuator, and carefully slide handle into place. Install attaching nuts, connect lock strap, check handle for proper operation and tighten strap attaching screw.

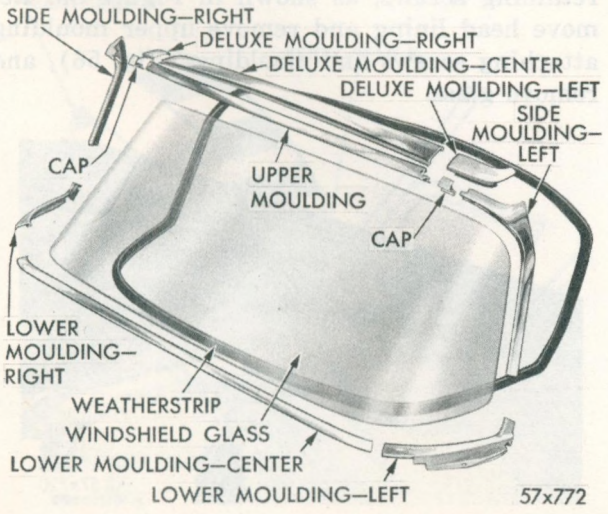


Fig. 49—Windshield and Moulding Assembly (C-75, C-76)

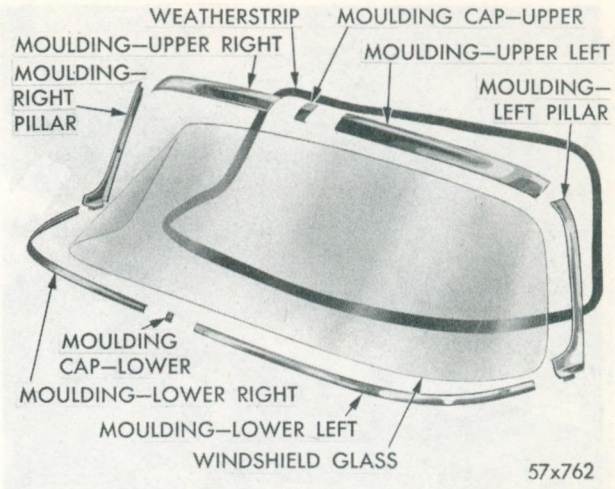


Fig. 50—Windshield and Moulding Assembly (Imperial Models)

22. REMOVAL AND INSTALLATION OF DOOR LOCK CYLINDER (All Models)

a. Removal

Remove the door trim panel and arm rest assembly and remote control handle. Remove the attaching lock link adjusting screw plug (Fig. 48), and remove the lock strap attaching screw. Remove two nuts holding the door handle to door from trim panel side of door and remove door handle. Remove barrel to handle assembly set screw. Insert key in lock and remove barrel.

b. Installation

Assemble lock barrel to handle, tighten barrel set screw. Check key and barrel assembly for proper operation in handle. Install the handle

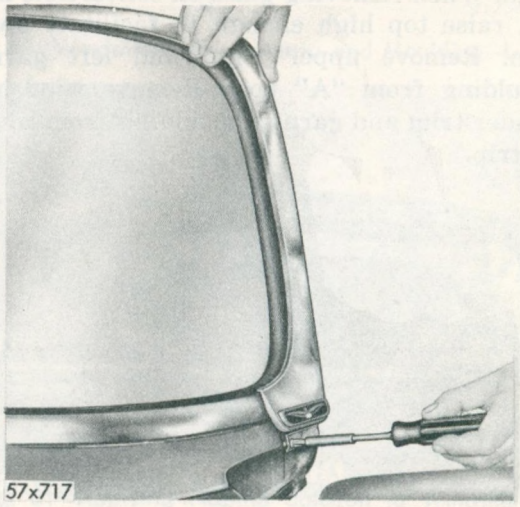


Fig. 51—Removing or Installing "A" Post Side Moulding

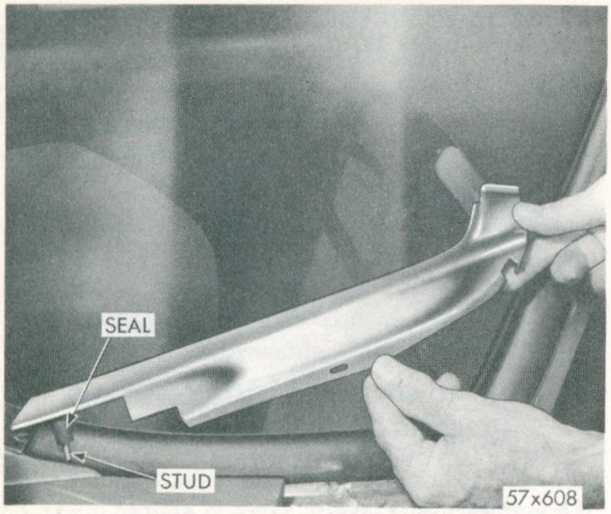


Fig. 52—Removing or Installing Lower Side Moulding

in door and secure the two handle to door panel securely by installing and tightening attaching nuts. Adjust the lock release, connecting strap and tighten adjusting screw.

NOTE: Whenever the door handle or lock and barrel assembly is replaced, the door lock rotor must be checked in the lock and release position for proper operation before re-installing trim panel. Install strap plug in door, and trim panel assembly. Check door and lock assembly.

23. REMOVAL AND INSTALLATION OF WINDSHIELD GLASS (C-75, C-76 and Imperial) (Refer to Figs. 49 and 50)

The following procedure also applies to Convertible Coupe models, except for removal and installation of inner garnish moulding and trim. When removing glass on convertible models, raise top high enough to facilitate operation. Remove upper right and left garnish moulding from "A" post. Remove windshield header trim and garnish moulding from weatherstrip.

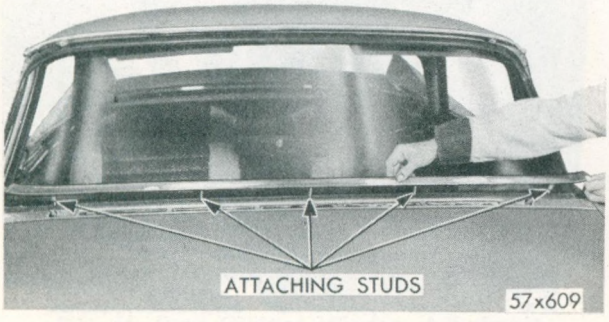


Fig. 53—Removing or Installing Horizontal Moulding

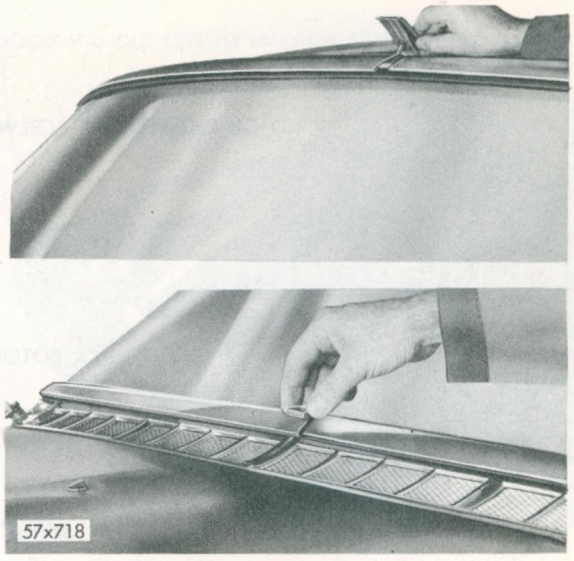


Fig. 54—Removing or Installing Upper and Lower Moulding Clips (Imperial Models)

a. Removing Mouldings

Protect hood and other necessary components of car with protective covering to avoid damaging finish. Remove "A" post side moulding (Fig. 51) attaching screws. **Avoid damaging door-to-"A" post seal.** Remove lower mouldings, as shown in Figure 52, lift upper horizontal moulding out of weatherstrip. Remove windshield wiper blades. Remove lower horizontal moulding clips and mouldings (Fig. 53).

On Imperial Models, remove "A" post side mouldings and upper and lower moulding retaining clips, as shown in Figure 54, and remove horizontal mouldings. Remove moulding retaining screws, as shown in Figure 55. Remove head lining and remove upper moulding attaching screws and moulding (Fig. 56), and remove glass.

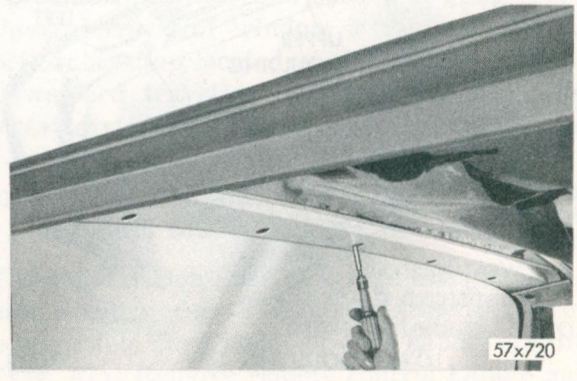


Fig. 55—Removing or Installing Moulding Retaining Screws (Imperial Models)

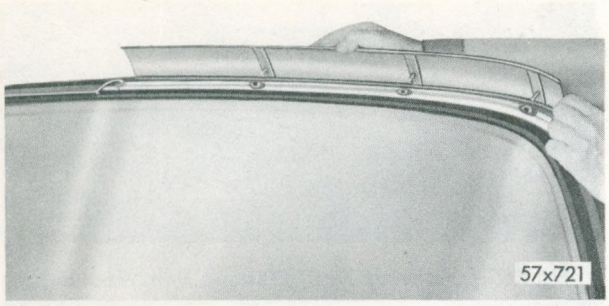


Fig. 56—Removing or Installing Upper Windshield Moulding (Imperial Models)

b. Removal and Installation of Windshield Glass

Unlock weatherstrip with wedge, as shown in Figure 57, (all around windshield) and install windshield glass. When removing glass from weatherstrip, it may be necessary to wear gloves to protect hands. With helper assisting on outside of car, remove glass from inside of car by exerting pressure at either corner to force glass out of the weatherstrip.

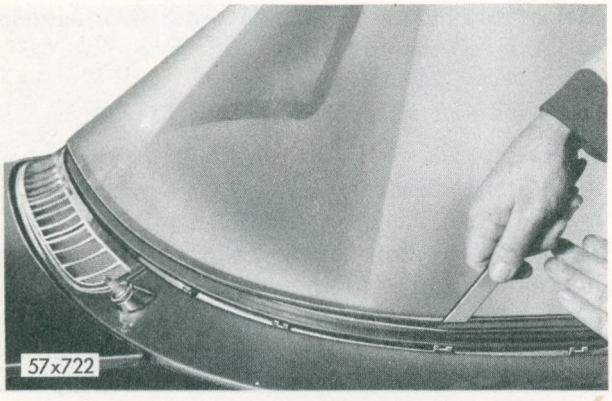


Fig. 57—Unlocking Windshield Weatherstrip

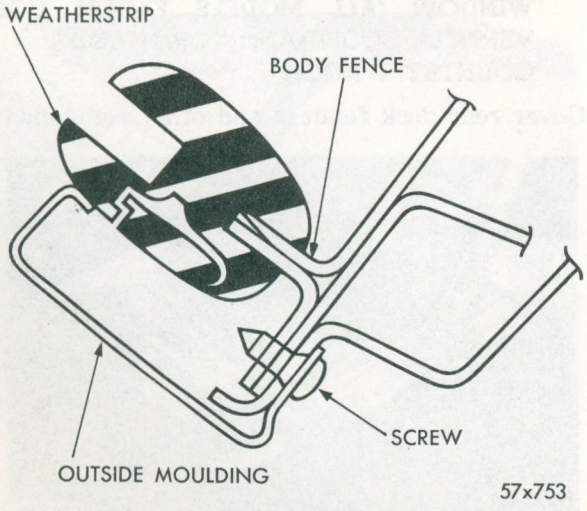


Fig. 58—Locating Moulding Retaining Clips on Body Fence (Imperial Models)

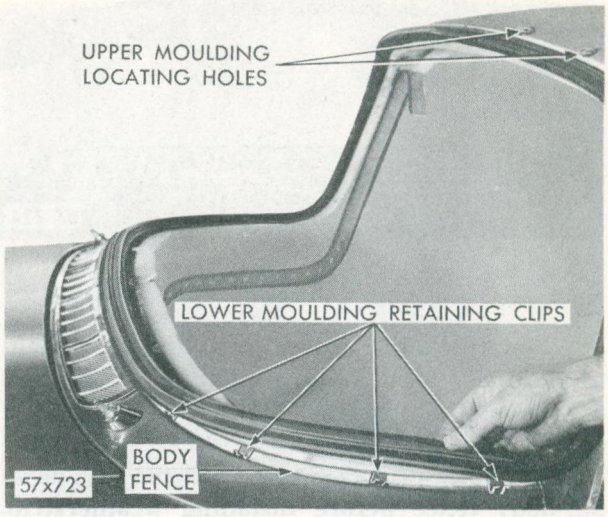


Fig. 59—Windshield Weatherstrip and Moulding—Sides

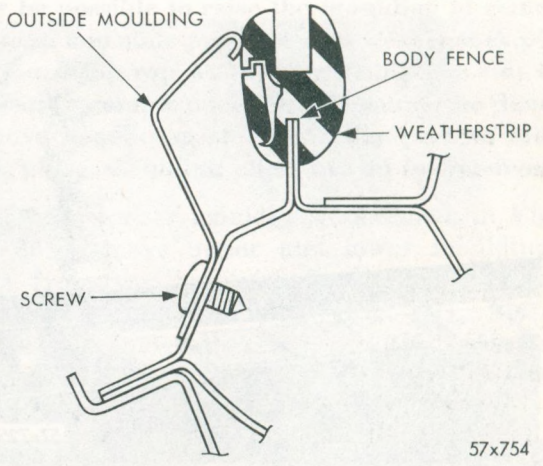


Fig. 60—Windshield Weatherstrip and Moulding—Lower

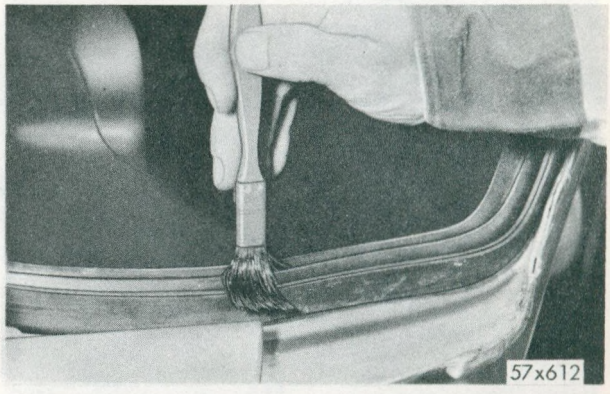


Fig. 61—Applying Naptha Solution to Windshield Weatherstrip

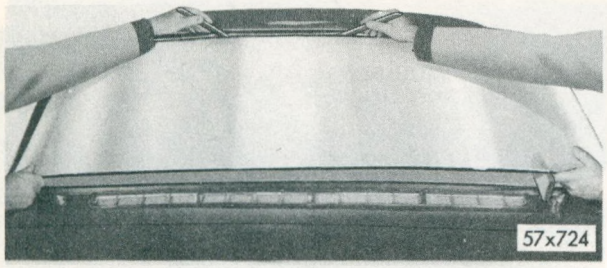


Fig. 62—Installing Windshield Glass

When installing glass on Imperial models, relocate moulding clips, as shown in Figures 58, 59, and 60.

NOTE: Make sure each clip is all the way down on body fence before installing weatherstrip.

Install windshield weatherstrip on body fence carefully, making sure the weatherstrip is properly seated. Coat weatherstrip with naphtha solution, using 2-inch brush, as shown in Figure 61.

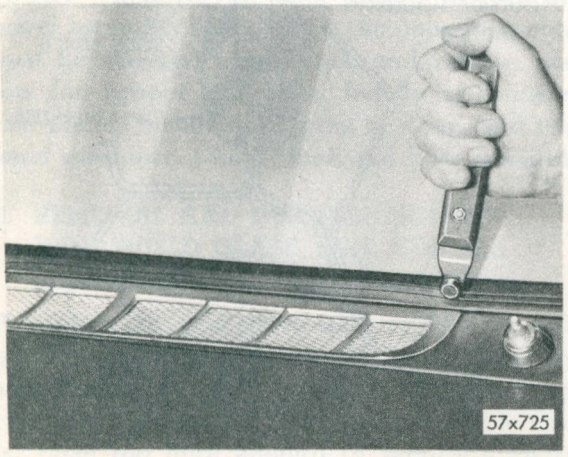


Fig. 63—Stripping Glass into Weatherstrip

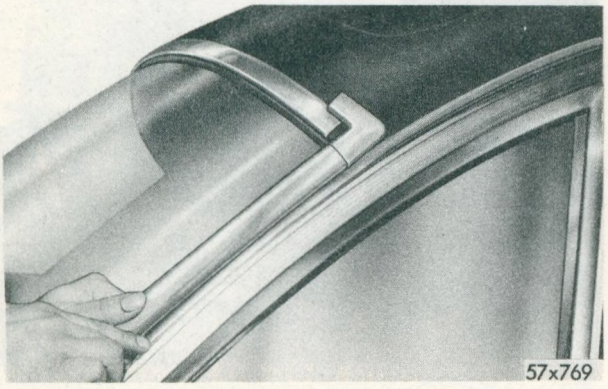


Fig. 64—Removing Rear Window Chrome Mouldings

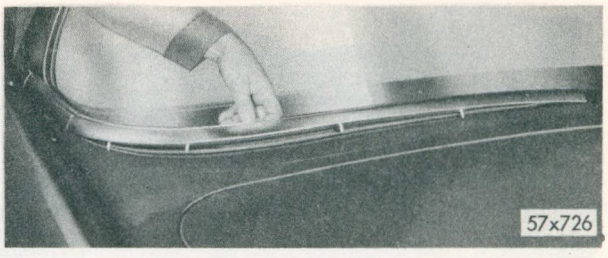


Fig. 65—Removing Rear Window Belt Moulding

Do not use a strong solution. Coat weatherstrip with MOPAR Sealer and center and insert upper end of glass in weatherstrip, as shown in Figure 62. Hold glass in position and insert wedge in weatherstrip groove, as shown in Figure 63, strip glass into weatherstrip. Pound glass into place with palm of hand. The weatherstrip will slip under lip of moulding with a slight popping noise.

CAUTION

Make sure glass is locked into weatherstrip properly all around glass.

c. Installation of Mouldings

On IM models equipped with bolted type upper moulding, align moulding attaching clips to holes in body. Apply sealer, install moulding. Tighten retaining screw (Fig. 64). Reinstall horizontal and side mouldings, clips. (Install head lining, on Imperial Models if removed). Reinstall windshield wiper blades and check for water leaks as indicated in Paragraph 2.

24. REMOVAL AND INSTALLATION OF REAR WINDOW (ALL MODELS EXCEPT CONVERTIBLE COUPE AND TOWN AND COUNTRY WAGON

Cover rear deck fenders and other components

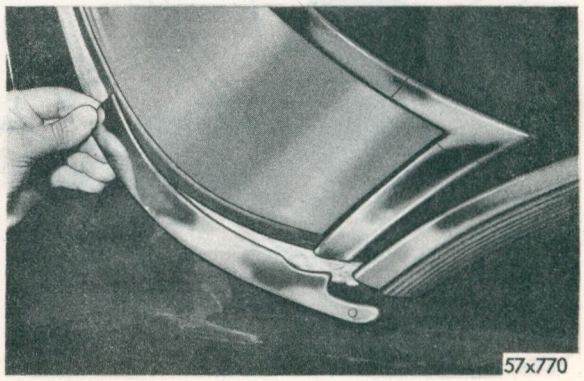


Fig. 66—Removing Lower Corner Moulding

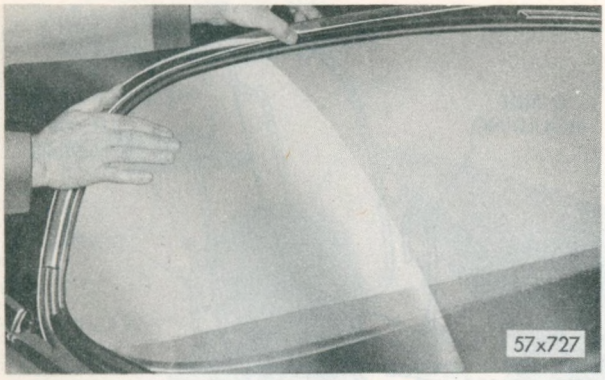


Fig. 67—Removing or Installing Upper Corner Moulding

to protect finish. Pry up on ends of upper chrome mouldings (Fig. 64) to release them from corner mouldings and remove mouldings. Remove belt moulding center cap. From inside luggage compartment, remove nuts and washers from belt moulding studs (see Fig. 65).

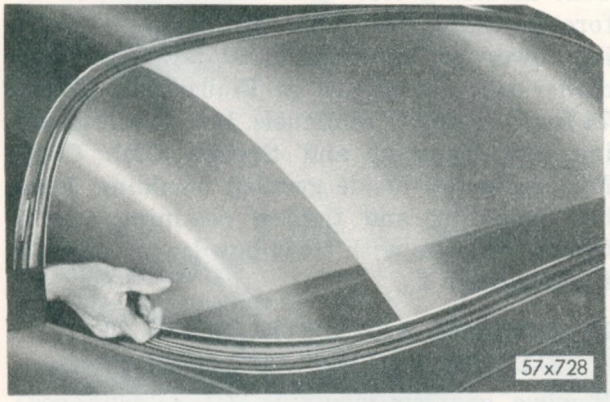


Fig. 68—Removing or Installing Rear Glass

Fig. 69—Removing Weatherstrip (Rear Glass)

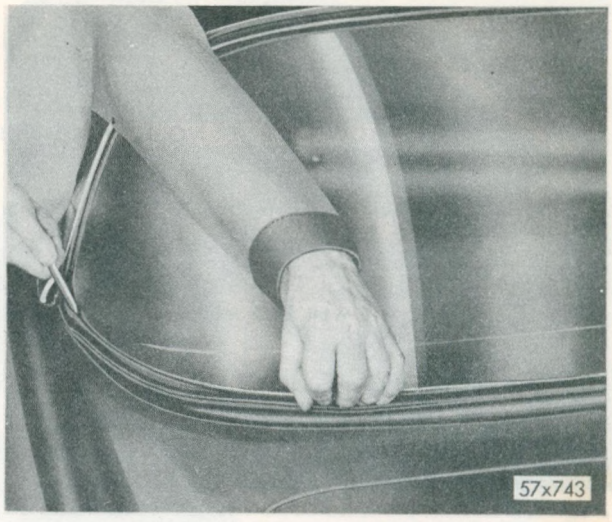


Fig. 70—Stripping Rear Glass in Body

The belt moulding is attached to door lock pillar and rear deck panel with clips. Remove clips, then remove belt moulding. **After removing belt moulding center cap and stud nuts, it may be possible to raise the moulding at center opening and slide moulding out of rear lock pillar moulding cap without loosening clip nut in passenger compartment. If this cannot be done, remove headlining at door pillar post so rear lock pillar moulding clip nut can be removed.**

Remove corner mouldings, as shown in Figure 66. Remove upper and lower mouldings clips from weatherstrip. Remove upper and lower horizontal moulding (Fig. 67). Insert wedge tool in weatherstrip locking strip and twist it slightly while sliding it around weath-

Fig. 71—Locking in Rear Glass

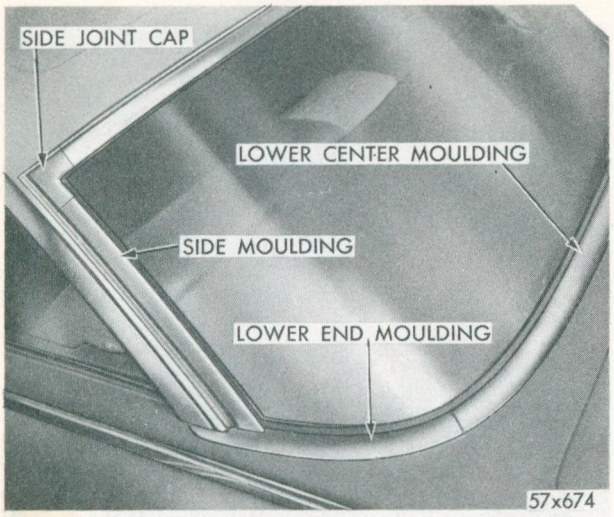


Fig. 72—Rear Window and Mouldings Installed

erstrip to unlock it from glass opening and remove glass (Fig. 68).

NOTE: When installing rear glass weatherstrip on Imperial Models, space moulding retaining clips equally apart on body fence, as shown in Figure 69.

Coat weatherstrip liberally with a naptha solution, using 2 -inch brush. Cover components to protect finish. Slide upper edge of glass into weatherstrip channel and allow glass to settle. Strip glass in lower end and seal glass in weatherstrip, using wedge tool. (Fig. 70). Start at inserted side and work across bottom, up the sides, and across top. Lock glass in weatherstrip, as shown in Figure 71.

Install upper trim moulding with aid of pull

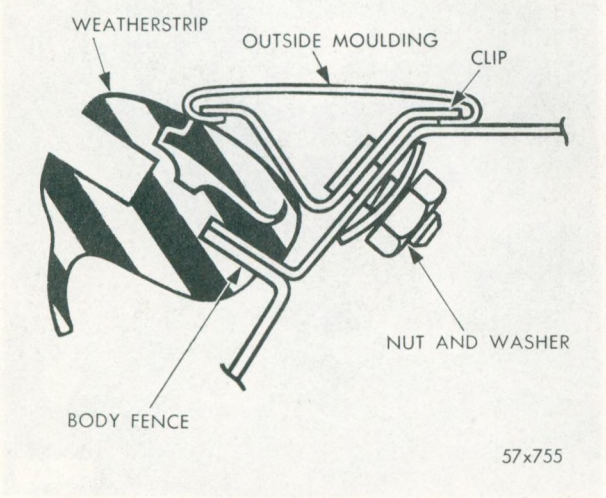


Fig. 73—Upper Rear Window Weatherstrip and Moulding

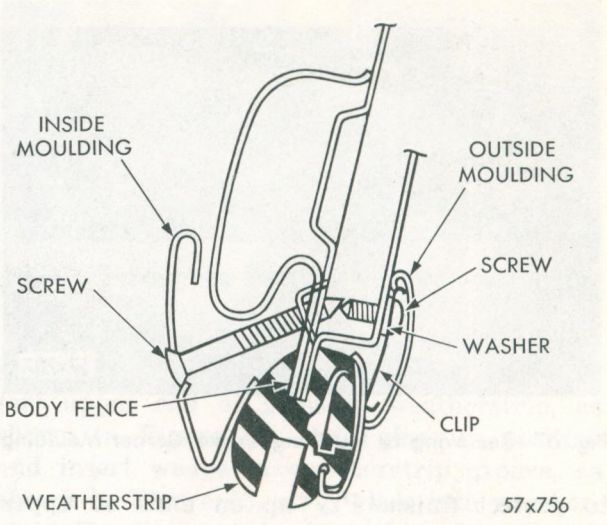


Fig. 74—Lower Rear Window Weatherstrip and Moulding

cord inserted in moulding slot of weatherstrip. Coat moulding slot with naptha solution before installing moulding. Install upper moulding, lower left and right mouldings, and upper corner caps, as shown in Figures 72, 73 and 74 for C-75 and C-76 Models. Install belt moulding. On Imperial and Special Club Coupe Models, install inside garnish moulding, lower belt moulding and tighten retaining screws. Check for leaks with trace powder as indicated in Paragraph 2.

25. REMOVAL AND INSTALLATION OF ELECTRIC WINDOW LIFT MOTOR

Remove garnish moulding (if so equipped), trim panel, arm rest assembly, and remote control handles. Refer to Fig. 75, and remove

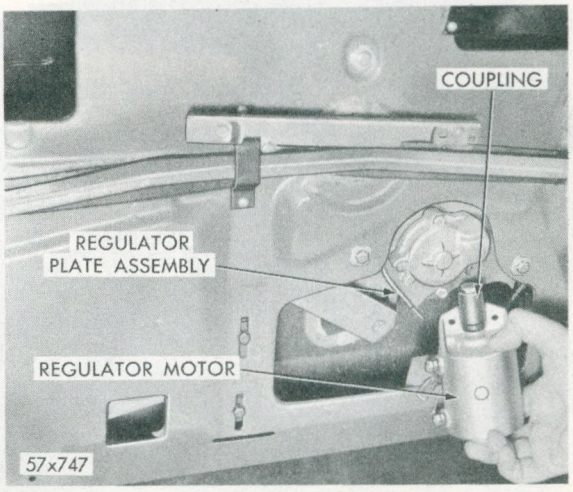


Fig. 75—Removing and Installing Window Lift Regulator Motor

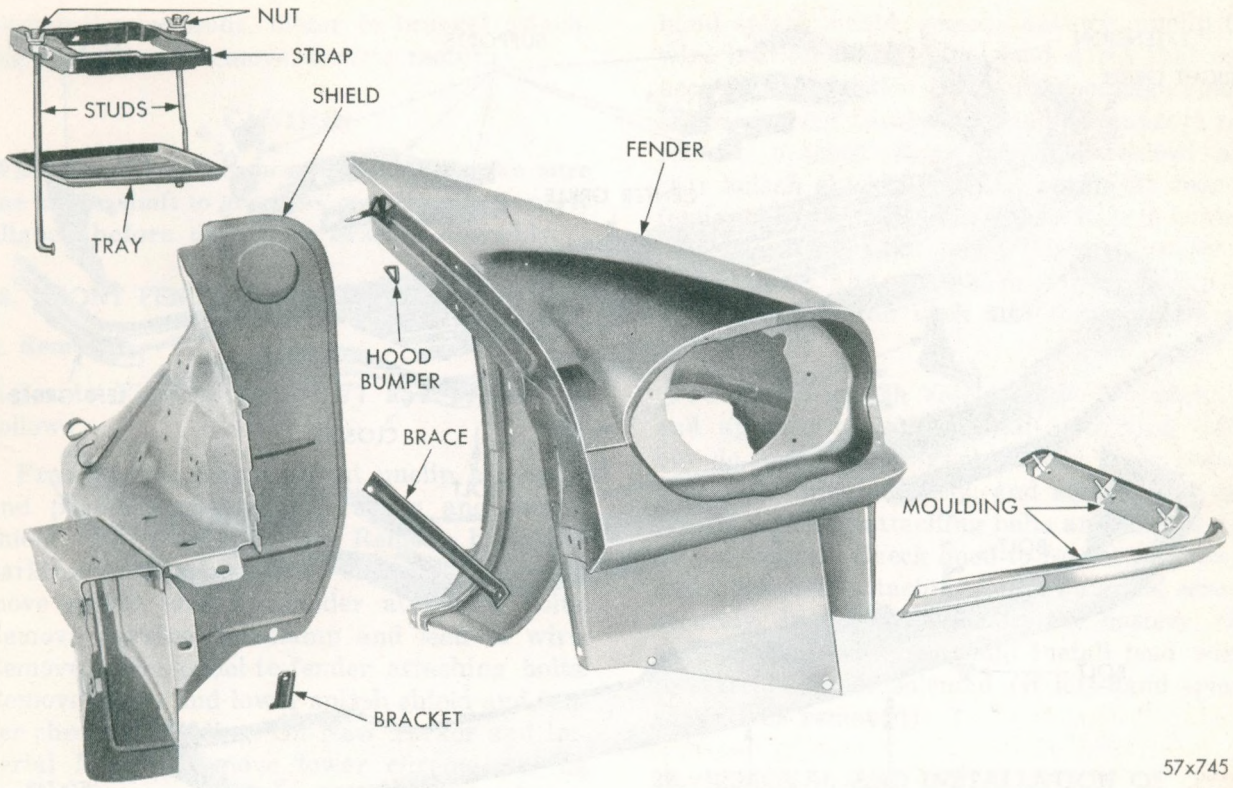


Fig. 76—Front Fender Assembly—Models C-75, C-76

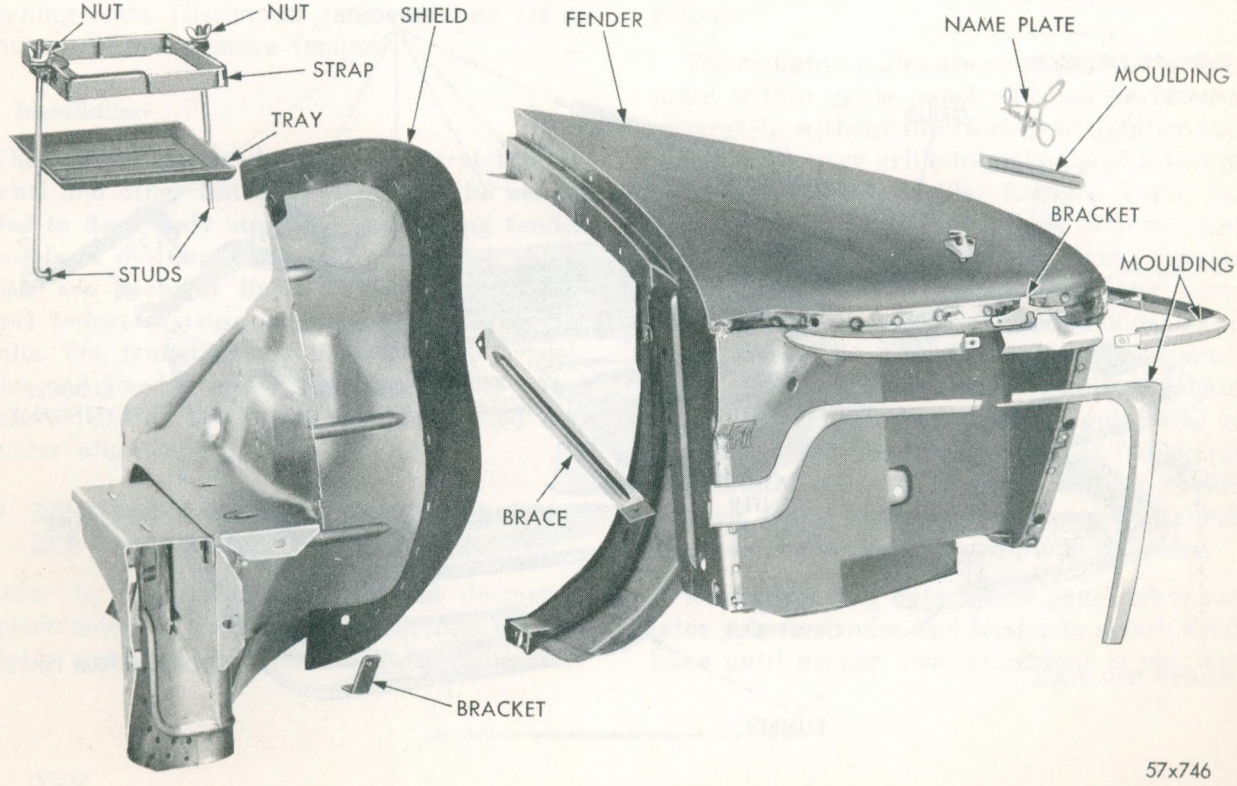


Fig. 77—Front Fender Assembly—Imperial

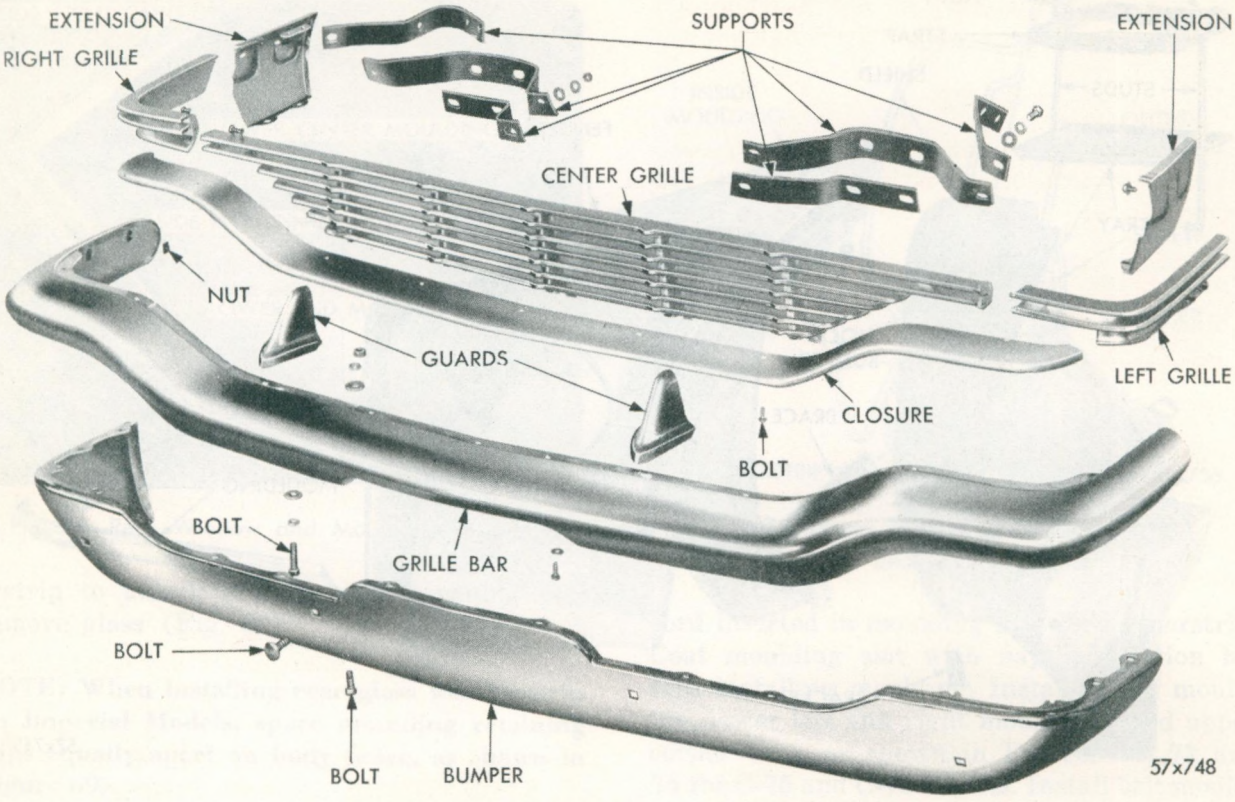


Fig. 78—Bumper ond Grill Assembly—C-75, C-76

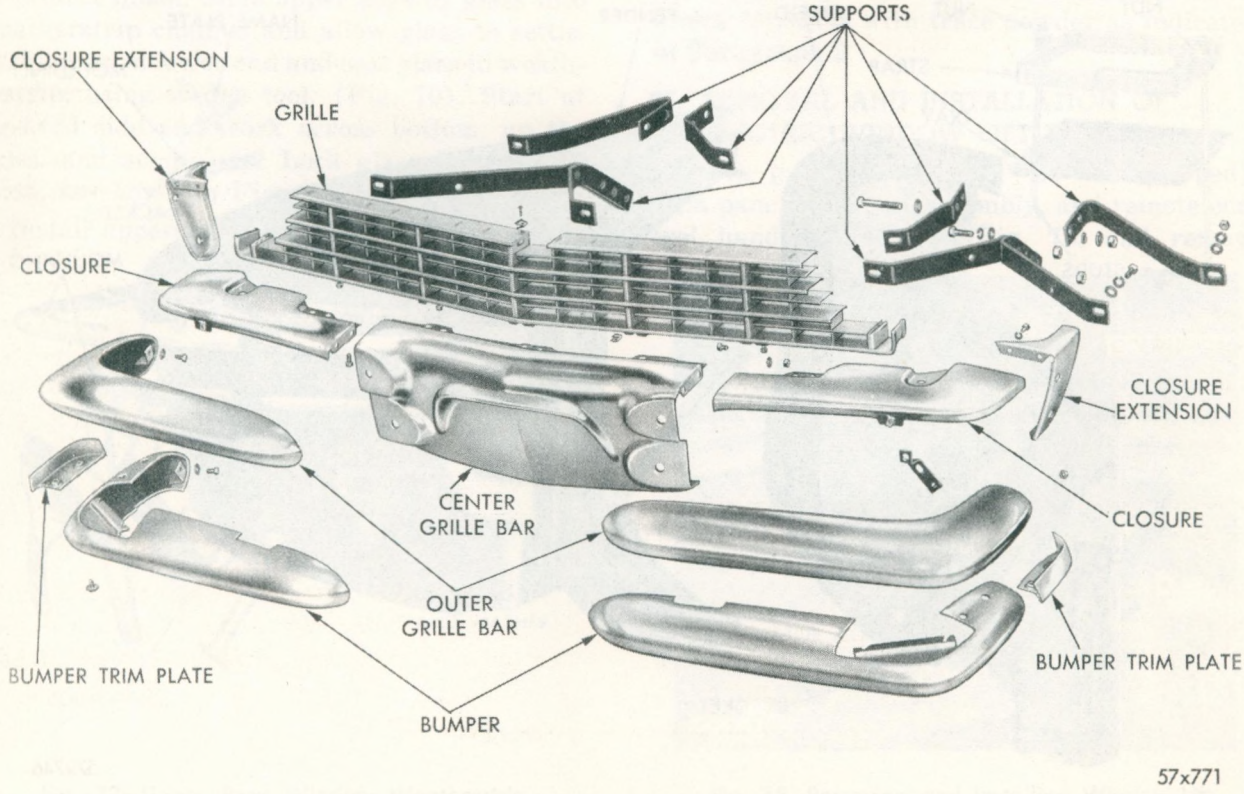


Fig. 79—Bumper and Grill Assembly—Imperial

electrical wire leads, motor to bracket attaching screws and remove electric motor.

CAUTION

When installing window lift motor, make sure the motor shaft to gear box coupling is properly aligned before tightening bracket assembly.

26. FRONT FENDERS (ALL MODELS)

a. Removal

Refer to Figures 76 and 77 and proceed as follows:

From engine compartment unclip headlamp and parking wires from fender and fender shield (left front fender). Remove head and parking lamps wires from terminal block. Remove splash shield-to-fender attaching bolts. Remove parking, headlamp and lead in wire. Remove grille panel-to-fender attaching bolts. Remove upper and lower splash shield and fender chrome moulding. On New Yorker and Imperial Models, remove lower chrome bar on fender. Remove fender-to-body, front and rear splash shields, grille panel, and fender yoke attaching bolts. From inside passenger compartment, remove fender-to-cowl quarter attaching bolts. Disconnect radio antenna (if so equipped) and remove fender.

b. Installation

When installing fender, do not scratch dash panel and other finish. **Fender must be assembled to dash body attaching stud. Hang fender loosely in position until cowl and splash shield seals are properly lined up with fender and cowl before starting and tightening attaching bolts.** The fender should be assembled in position and lined up with hood and grille panel before headlight is installed. Check hood and fender alignment.

27. REMOVAL AND INSTALLATION OF FENDER SPLASH SHIELD (ALL MODELS)

Refer to Figures 76 and 77 and disengage splash shield at rear lower fender bracket, radiator support, and fender. If removing left hand splash shield, remove battery, unclip the wire harness and remove lead wires that connect starting motor solenoid. Disengage splash shield support bracket at radiator support and remove bracket. Remove fender-to-cowl and rear splash shield attaching bolts, lift rear of fender slightly, and pull shield approximately 6 inches away from body. Support fender in this position, and pull splash shield out at rear, pushing down and back and sliding out from under car.

To install splash shield, slide it under car and up into position. Install attaching bolts, but do not tighten. Push fender back toward body, lift shield slightly, and slide shield into position. Install attaching bolts and screws, but do not tighten. Check hood-to-fender alignment and tighten all attaching bolts, nuts and screws securely. Install and connect the battery, clip wire harness to shield, and install lead wires to starting motor solenoid (if left-hand splash shield was removed).

28. REMOVAL AND INSTALLATION OF RADIATOR GRILLE AND BUMPER ASSEMBLY (ALL MODELS)

Refer to Figures 78 and 79 and proceed as follows:

The radiator grilles are assembled as separate units within grille panel and can be removed separately without interfering with other components. Remove grille-to-grille panel attaching bolts and remove grille. Remove lower half hook lock assembly and brace. Remove head and parking lamp terminals from terminal block. Remove both head and parking lamps. Remove grille moulding and extensions; loosen front fender to radiator yoke bolt. Remove panel-to-fender and splash shield attaching bolts. Disengage outer panel and pull panel out and away from fender openings. If installation necessitates removal of lower stone deflector, remove front bumper and remove attaching nuts and bolts and remove stone deflector.

When installing outer grille panel, leave radiator yoke-to-fender and fender-to-splash shield loose until proper hood alignment is obtained.

MAINTENANCE

29. HEADLINING

a. Removal

To remove the headlining on all models, except Convertible Coupe and Station Wagon, remove dome light assembly, rear seat cushion, and side and upper windshield garnish mouldings. On Special Club Coupe, remove "flipper" quarter window weatherstrip retainer and roof rail cover. Remove quarter glass garnish moulding and front pillar and roof side rail weatherstrip. On New Yorker and Imperial Models remove rear window glass and garnish moulding. On Windsor Models remove rear window glass and pull headlining out at top and down sides of window opening.

Pull headlining from under the rear package shelf and away from rear quarter panel and wheel housing. With screwdriver, pry headlining retainer strip (four-door sedan models only) away from roof rail above doors. Insert a piece of stiff wire, about eight inches long, between retainer strip and headlining to lift the headlining off retaining barbs, as shown in Figure 80. Pull headlining off retaining barbs at windshield header.

On all models, retaining brackets hold the rear headlining bow in position at the center. (Fig. 81) Pull the bow from brackets, spring the bow, and remove the end from holes in roof rail. Two sets of holes are provided in roof rails. Mark set of holes used, as shown in Figure 82. **On Imperial Limousine the front seat partition must be removed when installing headlining.**

Inspect roof pad silencer and cement silencer in place if necessary. **On Special Club Coupe Models,** remove the body front pillar and roof side rail weatherstrip and the drive nails at ends of headlining seams. Use a dull putty knife to separate the headlining from the roof rail. Carefully remove the material from the cemented surfaces on Special Club Coupe.

If new headlining is to be installed, remove the clips from bow ends, as shown in Figure 83, to permit removal of bow from listing. Bend

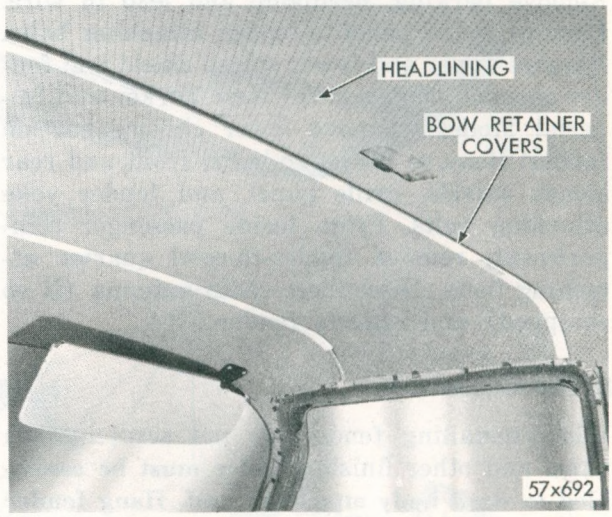


Fig. 81—Headlining Bows in Position

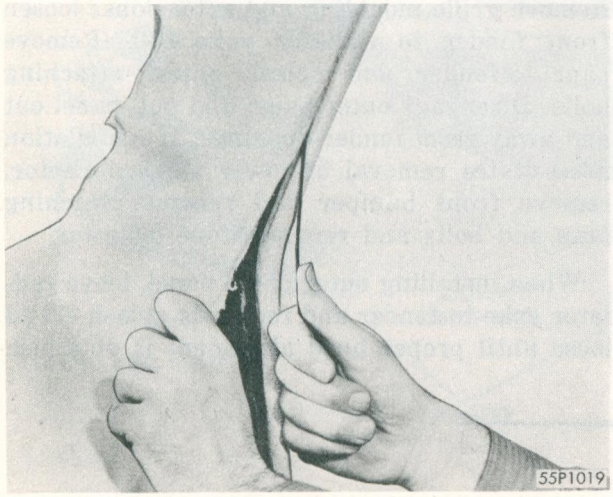


Fig. 80—Removing Headlining with Stiff Wire

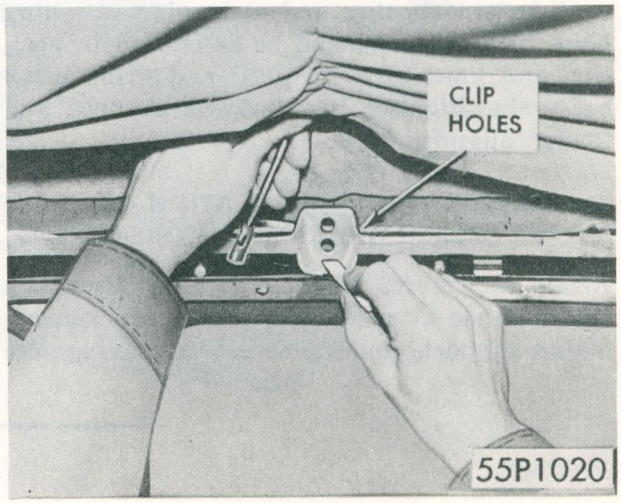


Fig. 82—Marking Holes

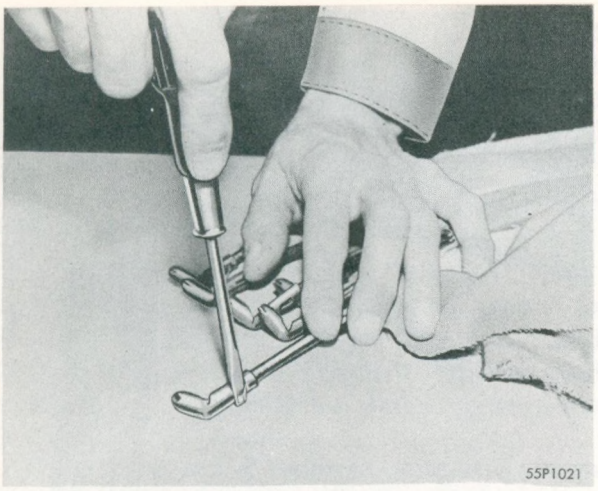


Fig. 83—Bending Locking Tab to Remove Clip from Bow

up locking tab of clip and remove clip. Starting at rear of headlining, remove each bow from the old listing and install bow in position in new headlining. This will assure correct installation of bows. Before installing bows in new headlining, trim excess listing even with edges of headlining. Notch headlining at front and rear ends by making small V-shaped cuts to indicate the center of material, as shown in Figure 84. Use these marks as guides to properly center the headlining.

b. Installation

Begin headlining installation at rear of car. Install rear bow in holes previously marked in roof rail. (On Imperial Models install on end of bows). Cut small hole in middle of listing for rear headlining bow support clip, as shown

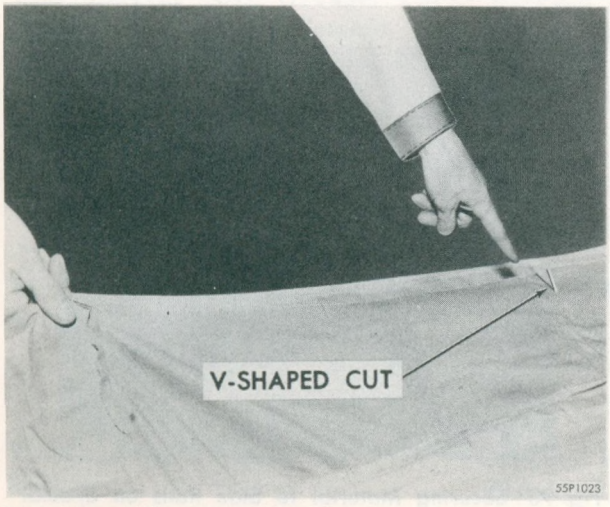


Fig. 84—Marking Headlining with Small V-Shaped Cuts

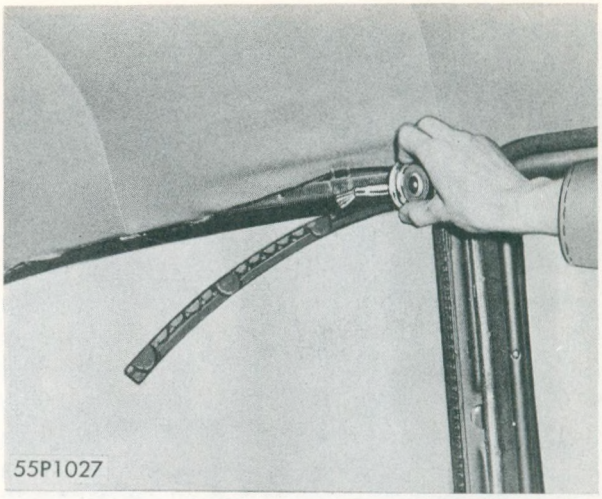


Fig. 85—Cutting Holes in Listing for Support Clip

in Figure 85. This will prevent headlining from wrinkling. Bend the retainer clip around the rear bow.

Install the remaining bow, stretching headlining evenly so that approximately the same amount of material hangs down at both sides. Apply cement to windshield header bar and rear glass ventilator and rear window opening Fig. 86. Cement to quarter panel and tack listings and seams to quarter panel opening. When cement is tacky, stretch headlining forward and over the cemented area end onto the barbs on windshield header. Make sure the first seam of headlining is straight. In most cases, the listing is longer than necessary. Cut the material at ends to prevent wrinkling at the seams when it is tucked or cemented in place. Cut listing from end up to clip. Do not cut listing too far up

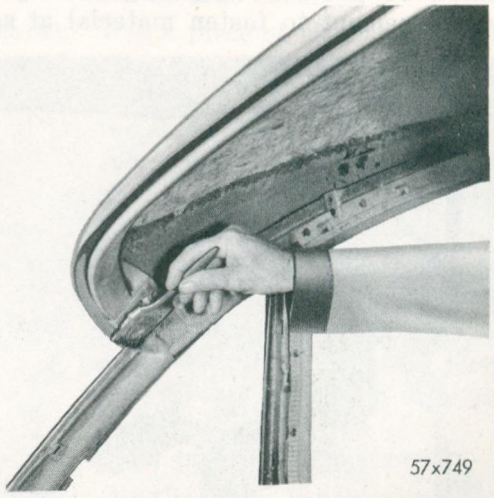


Fig. 86—Cementing Upper Rear Glass Quarter and Header Bar

Fig. 87—Trimming Excess Material from Windcord

the bow. Otherwise, the headlining will not fit properly. After listings are cut, start at front and trim headlining so that only ½ to 1 inch of material, hang down below door windcord on all models, except Special Club Coupe (Fig. 87).

Tuck in first and second seams between roof side rail and retainer with a dull putty knife, as shown in Figure 88. Tuck remaining material in place. When one man is performing the installation, work alternately from one side to other and complete one section at a time. Make certain that seams are straight. Keep material free from wrinkles until all of headlining is tucked in place between roof rail and retainer.

On Special Club Coupe Models, apply cement to the outside surface of roof rail, Fig. 89. Press headlining into position after cement is tacky. Make sure material is free from wrinkles. To prevent headlining from pulling loose, use cement to fasten material at seams

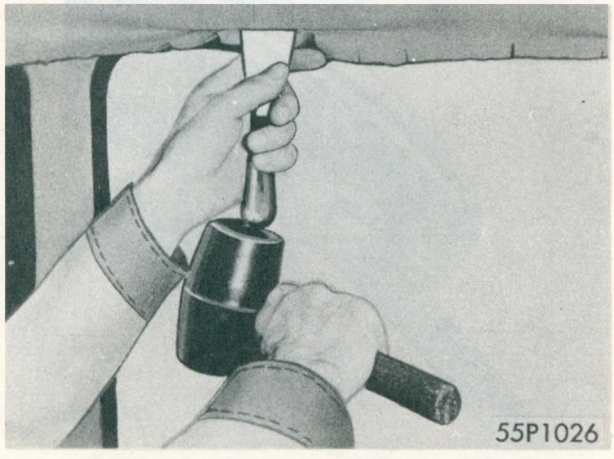


Fig. 88—Tucking Headlining between Roof Rail and Retainer

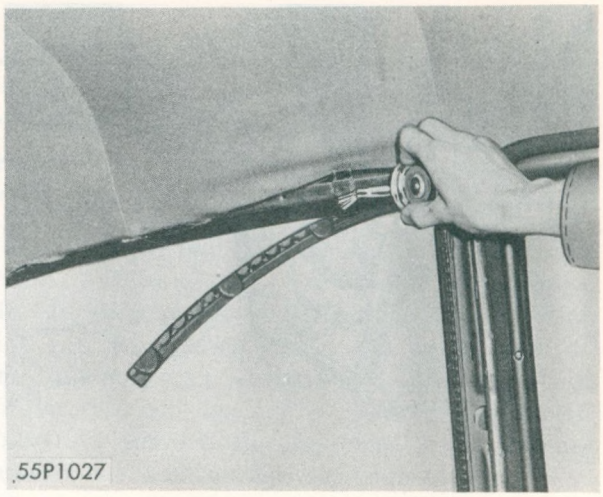


Fig. 89—Cementing Material to Underside of Side Rails at Quarter Window

to outside surface of rail, as shown in Figure 90.

To secure headlining at rear windows (all models except Town and Country Wagon), apply a light coating of cement to surface of opening, use cement sparingly. While allowing cement to become tacky, apply cement at quarter panel where material is to be cemented. Starting at center, press headlining onto cemented surface. Install the material across top and to a point about six inches from lower corners of window. Press material in place at quarter panel.

Install remaining portion of headlining at rear window and work out wrinkles. Tuck in remaining portion at forward edge of quarter panel. Locate center of dome light bracket.

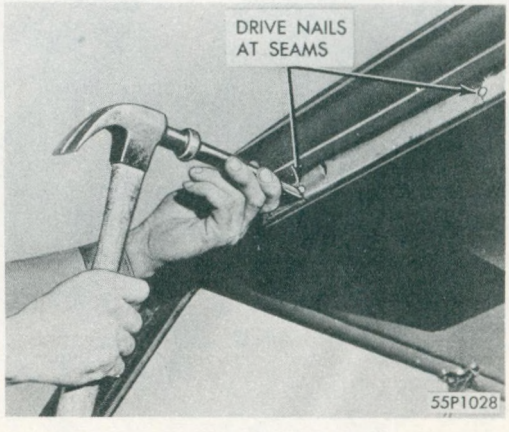


Fig. 90—Securing Material to Side Rails on Special Club Coupe

Cut a small hole in headlining at this point and pull wires through opening. Install wires to housing, apply a small amount of cement to inner edge of dome light bracket and install dome light. Install rear window, rear seat cushion, visors dome light windshield mouldings, and garnish moulding lights.

30. CLEANING OF INTERIOR UPHOLSTERY

The interior and exterior of body should be frequently cleaned during life of car to guard against deterioration. Frequent washing and polishing of body exterior and chrome parts will protect the finish.

Most stains can be removed quite easily from fabrics while they are fresh and have not hardened and set into the fabric. An exception is mud or clay, which should be allowed to dry so that most of it can be brushed off. It is also very helpful, though often not possible, to know the nature of standing matter so that proper solvent may be used. Most common stains can be removed with either a dry cleaning solvent, such as MOPAR Fabric Cleaner or carbon tetrachloride cleaning fluid, or with a water solution containing one-half of 1% of a non-alkaline detergent. Thus, if the nature of staining matter can only be guessed at and a dry cleaning fluid does not remove the stain, it should then be cleaned with a one-half of 1% solution of a detergent in water, or vice-versa. Some of the more common upholstery stains can be removed as follows:

Type of Seat Material	Type of Soil	Cleaners Recommended	Cleaning Procedure
Fabric	Oil, Grease, Tar Trim Cement	MOPAR Fabric Cleaner Part #680183	Wet a piece of clean white cheesecloth with a little cleaning fluid. Wring out excessive solvent. Wipe the fabric with a lifting motion working from the perimeter of the spot toward the center. Repeat the procedure with a clean piece of cheesecloth until spot is removed.
Fabric	Candy, Ice Cream, Soda, Catsup, Mustard	0.5 solution of household detergent in water	Same cleaning procedure as above using recommended cleaner.
Fabric	Dirt	MOPAR Kar Kleen, Part #1643100 and fairly stiff bristled brush.	Dip the brush in a container of Kar Kleen and scrub the entire cushion or seat back. Wipe dry as possible with a turkish towel. Allow to dry over night before sitting on cushion or seat back.
Vinyl and real leather	Oil, Grease, Tar, Trim Cement	MOPAR Fabric Cleaner Part #690183. Household detergent and water.	Wet a piece of clean white cheesecloth with a little solvent cleaning fluid and wring out excess. Rub out the spot. Use a brush on stubborn spots. Go over cleaned area with cheesecloth wetted with solution of household detergent and water. Wipe dry with clean piece of cheesecloth.
Vinyl and real leather	Candy, Ice Cream, Soda, Catsup, Mustard	MOPAR Kar Kleen, Part #1643100	Wet a piece of clean white cheesecloth with recommended cleaners and rub out spot. Use a brush on stubborn spots, wipe dry with a clean piece of cheesecloth.
Vinyl and real leather	Dirt	MOPAR Kar Kleen, Part #1643100, and a fairly stiff bristled brush.	Dip the brush in a container of the Kar Kleen and scrub the entire cushion or seat back. Wipe dry with a turkish towel or equivalent.

31. PAINT FINISH CONDITIONS

a. Dark Spots Appearing on Paint (Polychromatic)

This condition can be caused by foreign particles that are carried through the air and settle on the flat surfaces of paint.

If any of this foreign substance, containing acid-like particles, is allowed to remain on paint for any length of time, it may result in a spotting condition. This spotting condition is caused by the reaction of such particles with the aluminum, used in all polychromatic paints, causing the aluminum flakes to disappear, leaving the base color. These same acid-like particales can also attach a non-metallic paint, but it will usually result in a etched condition rather than a discoloration.

In view of the foregoing, it is advisable to wash cars frequently to prevent the possibility of such conditions occurring.

b. Foreign Material in Paint

In some instances where minute particles of foreign material have embedded themselves in the horizontal surface of paint, they are quite likely abrasives, such as metal particles, that have been carried through the air. If particles are allowed to remain on paint surface for any length of time in the presence of moisture, a chemical reaction will take place, resulting in metal particles eating into paint surface. Early removal of this material by a thorough washing will prevent this from happening. When above described condition is encountered in the field, it is often mistakenly diagnosed as rust coming up from the metal below the paint.

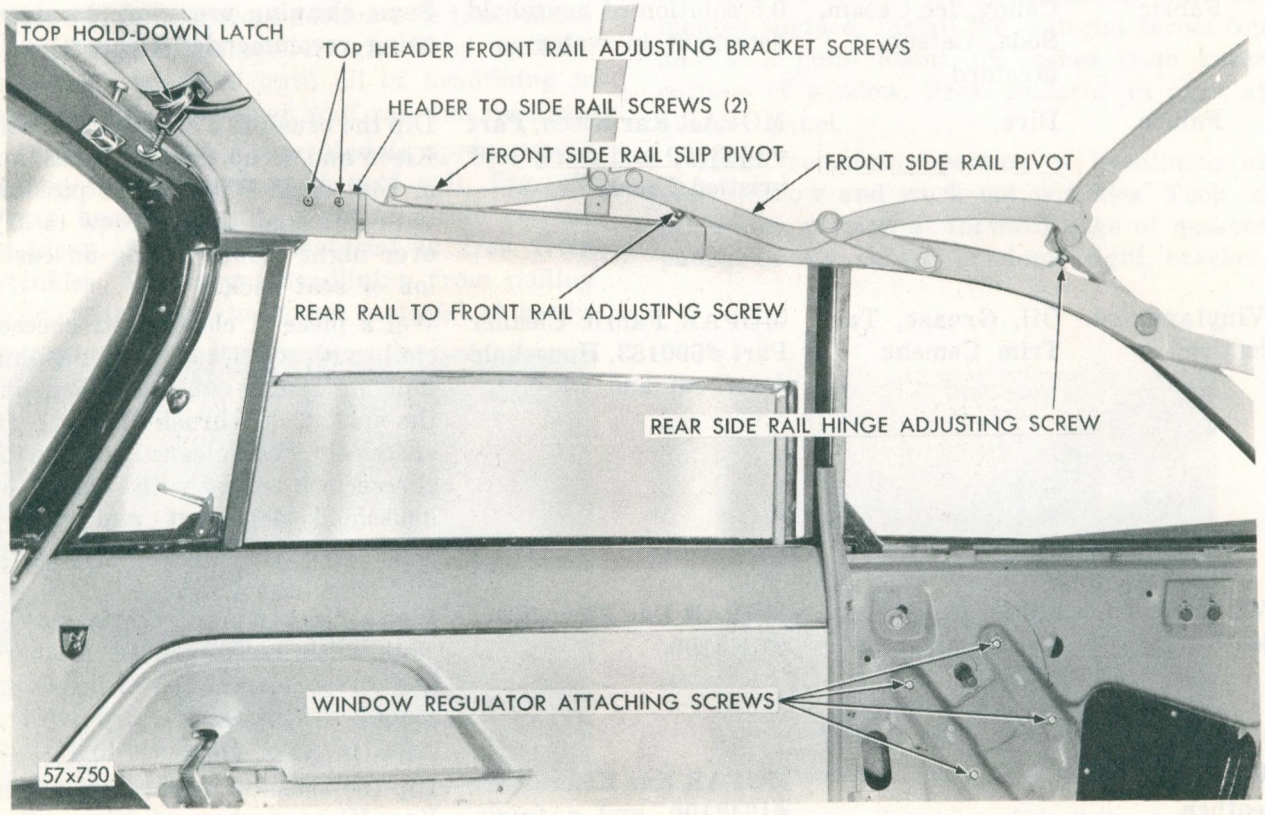


Fig. 91—Convertible Top Side Rail and Latch Assembly

CONVERTIBLE COUPE TOP

32. OPERATING THE CONVERTIBLE COUPE TOP

a. To Lower Top

To lower the Convertible Coupe top, Models C-75—C-76, turn sun visors to one side and unlock both top latches (Fig. 91). To release top unzip both rear side curtains and remove top cover bag from top well. Move top control switch lever located on instrument panel to left and hold in this position until top is completely lowered.

On Imperial Models, release safety catch on locking handle located in center of header, pull handle down all the way back. This will release top.

CAUTION

Never lower top when it is wet. The top cover should be placed in the top cover bag and stored in luggage compartment. Never store top cover in top well compartment.

b. To Raise Top

WARNING

Never attempt to raise or lower the top while the car is in motion. It is advisable to raise and lower the top at least once a month to keep the top mechanism in working condition.

Remove well compartment cover. Move top control switch to right and hold it in this position until top is completely raised Install rear curtain and engage zipper—C-75 and C-76 Models. Pull top down firmly on top header. Engage and lock both top latches to lock top securely in position.

On Imperial Models—pull top down firmly on top header. Push locking handle all the way forward until safety catch engages.

NOTE: Be sure both sides are engaged when latching.

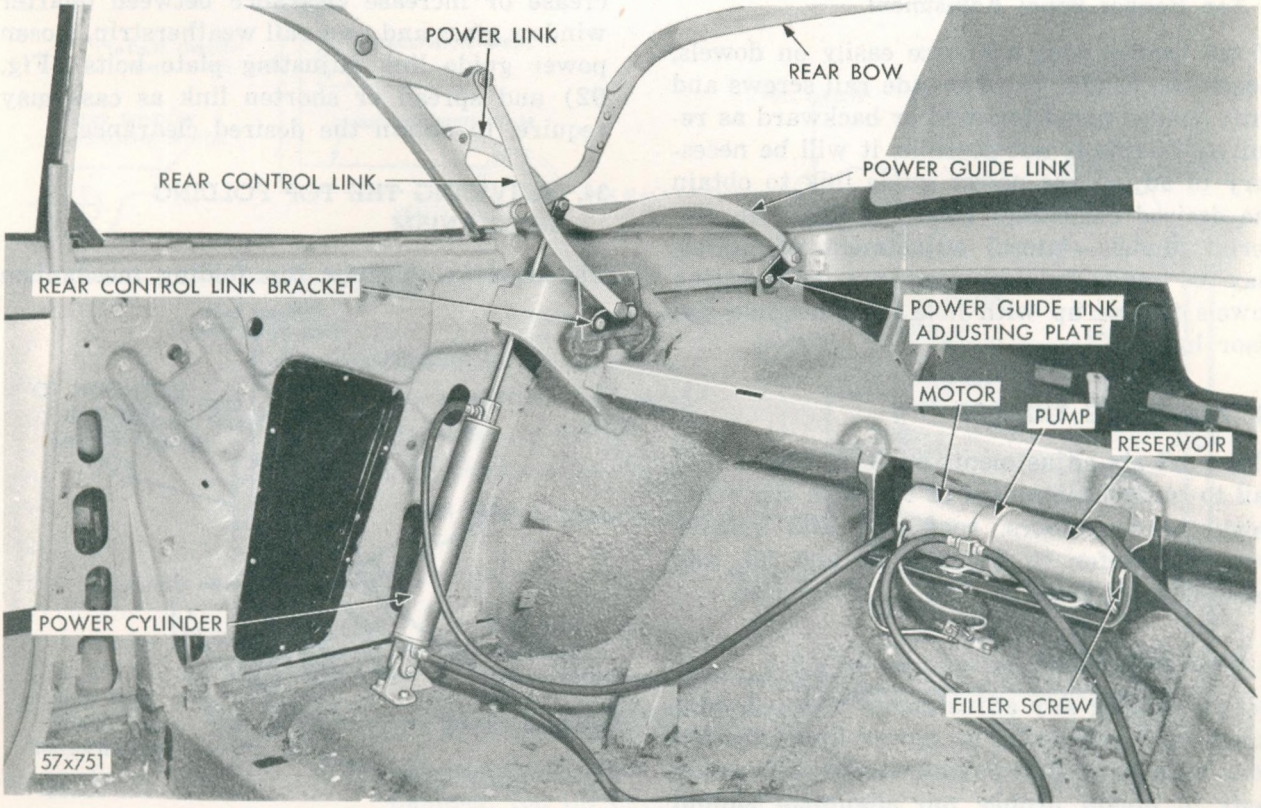


Fig. 92—Convertible Top Hydraulic Folding Mechanism

c. Roof Side Rail Alignment (All Models)

The adjustment of front side rail and header panel to windshield is controlled by the rear control link which is fastened to the quarter panel compartment (Fig. 91).

Also affecting the side rail weatherstrip sealing at top of door glasses are front side rail hinge adjusting screws and rear side rail hinge adjusting screws, as shown in Figure 91 (C-75 and C-76 only). If front side rail joints are open when top is fully raised, turn front side rail hinge adjusting screws counterclockwise until joints are closed. If after making this adjustment, the clearance between door glass and side rail is increased or decreased, adjust the rear adjusting screw to obtain the desired clearance.

On All Models leveling of top can be accomplished by lowering or raising the rear control link bracket. When adjusting the rear control link, care should be taken to adjust both sides equally to maintain parallelism between header panel and windshield frame. Before making this adjustment, loosen top header at windshield to remove tension from linkage.

d. Top Header Panel Adjustment

If the header does not close easily on dowels, loosen the header panel-to-side rail screws and shift header panel forward or backward as required. If this is not possible, it will be necessary to adjust the power guide link to obtain the desired clearance. (See Fig. 96). On Imperial Models—lateral adjustment of dowels may be made by loosening nut and setting dowels to line up with hole in removable sun visor bracket

33. ADJUSTING THE TOP

There are six adjustments on each side of roof rail to control alignment of top with the windshield header, doors, roof rail, and quarter windows. Refer to Figures 91 and 92, and proceed as follows:

a. Body Adjustment

Before making any adjustments of top header panel, roof side rails, or power links, tighten body bolts to 18 foot-pounds torque. **Shimming body to obtain proper top alignment should only be done in extreme cases where there is doubt as to proper frame-to-body alignment. If body must be shimmed, refer to Figure 32 for correct body shimming methods.**

CAUTION

To avoid stripping adjusting screw threads, loosen Allen set screw locking the adjusting screws in hinge and rail brackets (Fig. 91) before attempting to adjust locking screws.

b. Power Link Adjustment

With top and all door and quarter window glasses in raised position, carefully inspect door and quarter window glass for correct fit at side rail and vertical seals Fig. 93. Adjustment for proper alignment of quarter window glass-to-roof rail weatherstrip is made at the power guide link adjusting plate (Fig. 92) with top in partially raised position. Refer to Figures 91 and 92 for door glass-to-roof rail weatherstrip clearance.

NOTE: On Imperial Models there is no power guide link.

Adjust the lower outside power link for fore and aft and up and down movement. To decrease or increase clearance between quarter window glass and roof rail weatherstrip, loosen power guide link adjusting plate bolts (Fig. 92) and spread or shorten link as case may require, to obtain the desired clearance.

34. SERVICING THE TOP FOLDING MECHANISM

The electric-hydraulic top folding mechanism

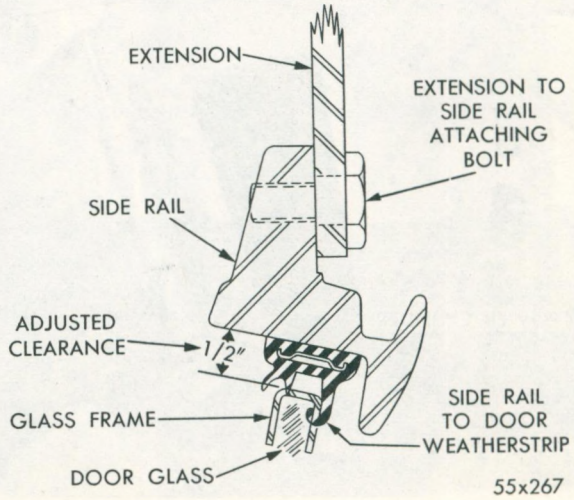
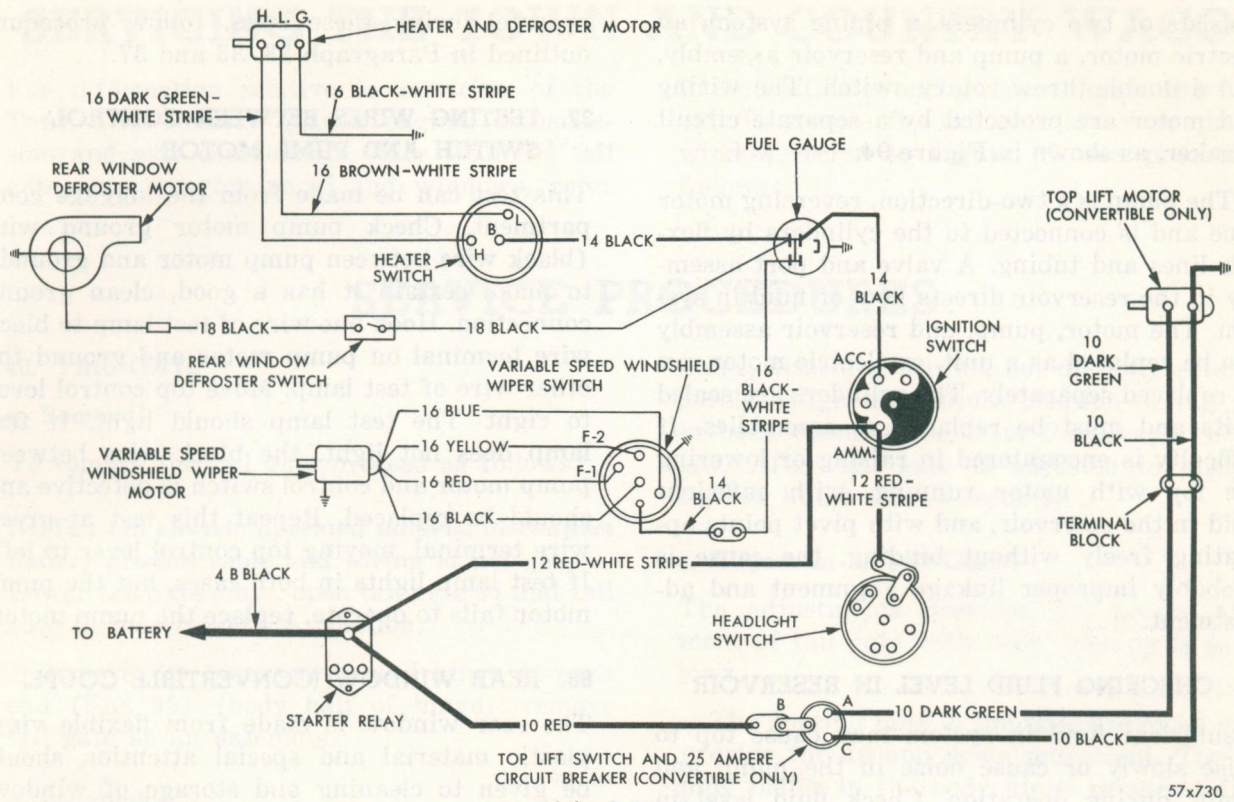


Fig. 93—Convertible Side Rail Weatherstrip



Models C-75, C-76

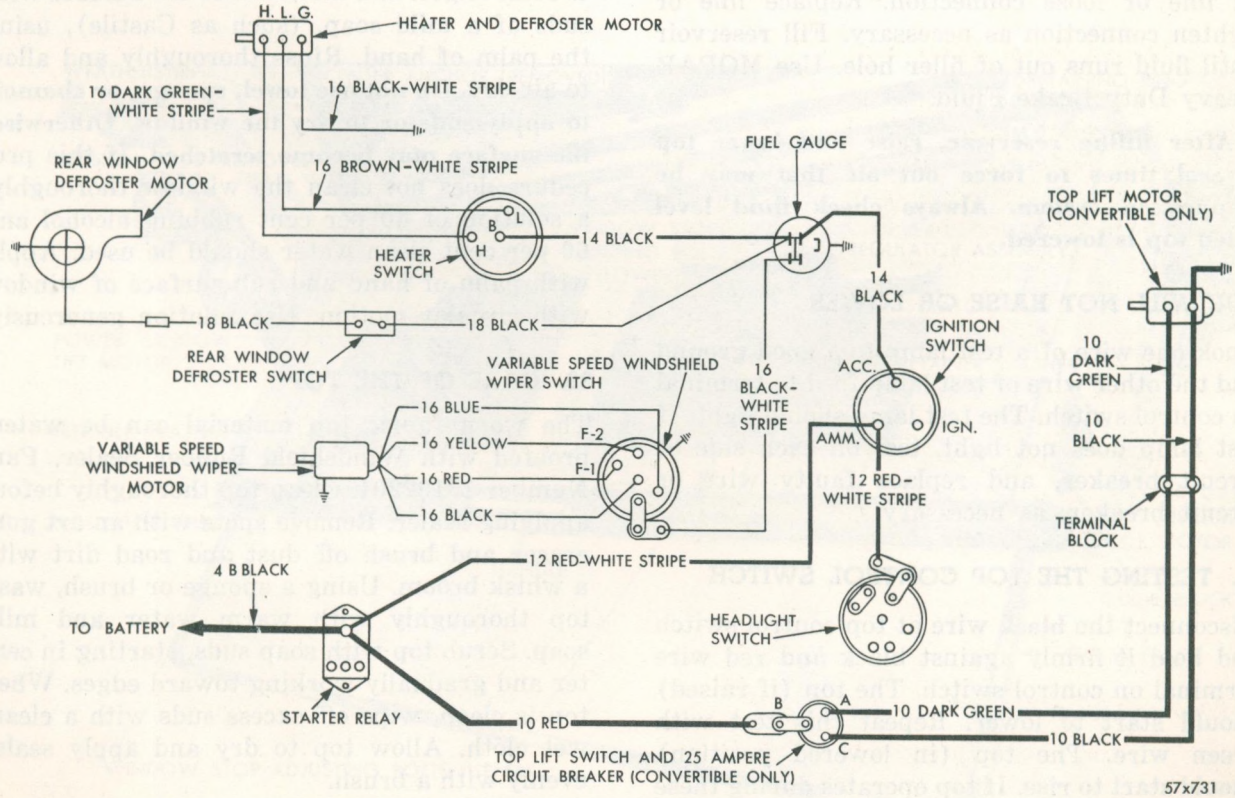


Fig. 94—Windshield Wiper, Heater, Rear Window Defroster, Top Lift Circuit Wiring Diagram Model—Imperial

consists of two cylinders, a piping system, an electric motor, a pump and reservoir assembly, and a double-throw rotary switch. The wiring and motor are protected by a separate circuit breaker, as shown in Figure 94.

The pump is a two-direction, reversing motor type and is connected to the cylinders by flexible lines and tubing. A valve and port assembly in the reservoir directs flow of fluid in system. The motor, pump, and reservoir assembly can be replaced as a unit, or electric motor can be replaced separately. The cylinders are sealed units and must be replaced as assemblies. If difficulty is encountered in raising or lowering the top with motor running, with sufficient fluid in the reservoir, and with pivot points operating freely without binding, the cause is probably improper linkage alignment and adjustment.

35. CHECKING FLUID LEVEL IN RESERVOIR

Insufficient fluid in system may cause top to raise slowly or cause noise in the pump and motor during operation Check fluid level in reservoir. If low, check for a leak due to broken line or loose connection. Replace line or tighten connection as necessary. Fill reservoir until fluid runs out of filler hole. Use MOPAR Heavy Duty Brake Fluid.

After filling reservoir, raise and lower top several times to force out air that may be trapped in system. Always check fluid level when top is lowered.

TOP WILL NOT RAISE OR LOWER

Hook one wire of a test lamp to a good ground and the other wire of test lamp feed to terminal on control switch. The test lamp should light. If test lamp does not light, test on each side of circuit breaker, and replace faulty wire or circuit breaker, as necessary.

36. TESTING THE TOP CONTROL SWITCH

Disconnect the **black** wire at top control switch and hold it firmly against black and red wire terminal on control switch. The top (if raised) should start to lower. Repeat this test with green wire. The top (in lowered position) should start to rise. If top operates during these tests, but fails to operate when control switch lever is moved to right or left, the switch is at fault and should be replaced. If top fails to operate during these tests, follow procedure outlined in Paragraph 33, 35 and 37.

37. TESTING WIRES BETWEEN CONTROL SWITCH AND PUMP MOTOR

This test can be made from the luggage compartment. Check pump motor ground wire (black wire between pump motor and ground) to make certain it has a good, clean ground connection. Hook one wire of test lamp to black wire terminal on pump motor and ground the other wire of test lamp. Move top control lever to right The test lamp should light. If test lamp does not light, the black wire between pump motor and control switch is defective and should be replaced. Repeat this test at green wire terminal, moving top control lever to left. If test lamp lights in both cases, but the pump motor fails to operate, replace the pump motor.

38. REAR WINDOW (CONVERTIBLE COUPE)

The rear window is made from flexible vinyl plastic material and special attention should be given to cleaning and storage of window. To clean window, rinse with cold water spray to remove grit and dirt. Lather the surface with suds of a mild soap, (such as Castile), using the palm of hand. Rinse thoroughly and allow to air dry. **Do not use towel, sponge, or chamois to apply suds or to dry the window. Otherwise, the surface may become scratched.** If this procedure does not clean the window thoroughly, a solution of 40 per cent rubbing alcohol and 60 per cent clean water should be used. Apply with palm of hand and rub surface of window with circular motion. Use solution generously.

39. CARE OF THE TOP

The worn fabric top material can be waterproofed with Windshield Rubber Sealer, Part Number 13162201. Clean top thoroughly before applying sealer. Remove spots with an art gum eraser and brush off dust and road dirt with a whisk broom. Using a sponge or brush, wash top thoroughly with warm water and mild soap. Scrub top with soap suds, starting in center and gradually working toward edges. When top is clean, wipe off excess suds with a clean, wet cloth. Allow top to dry and apply sealer evenly with a brush.

Before lowering top, make sure the fabric is completely dry. Dampness may cause formation of mildew and damage to the fabric will result.

SERVICING THE TOWN AND COUNTRY WAGON

For information relative to servicing of the Town and Country Wagon engine, transmission and axle components other than the tail gate, rear quarter panel and windows, refer to the Section covering these items in this Manual To service the tail gate and rear quarter window, refer to Figure 95 and proceed as follows:

SERVICE PROCEDURES

40. TAIL GATE

a. Removal

To remove the tail gate proceed as follows:

NOTE: On electric operated models, disconnect battery ground cable and wiring at tail gate. Lower tail gate glass, open tail gate so that tail gate is in straight up position.

Remove the four screws and hinge at each end (Fig. 95) (body half of hinge), remove tail gate as an assembly.

b. Installation

Position tail gate straight up on body. Install hinge, attaching screws, but do not tighten securely. Align and adjust position of tail gate in body opening. Refer to Paragraph "c" below. After tail gate is adjusted to opening, tighten hinge screws securely.

c. Alignment of Tail Gate

The adjustments provided for proper alignment of tail gate with body opening is as follows:

The floating nuts in the tail gate panel hinge provide for up and down movement. The tapping plates in the body hinge provide adjustment from side to side and fore and aft at bottom of tail gate.

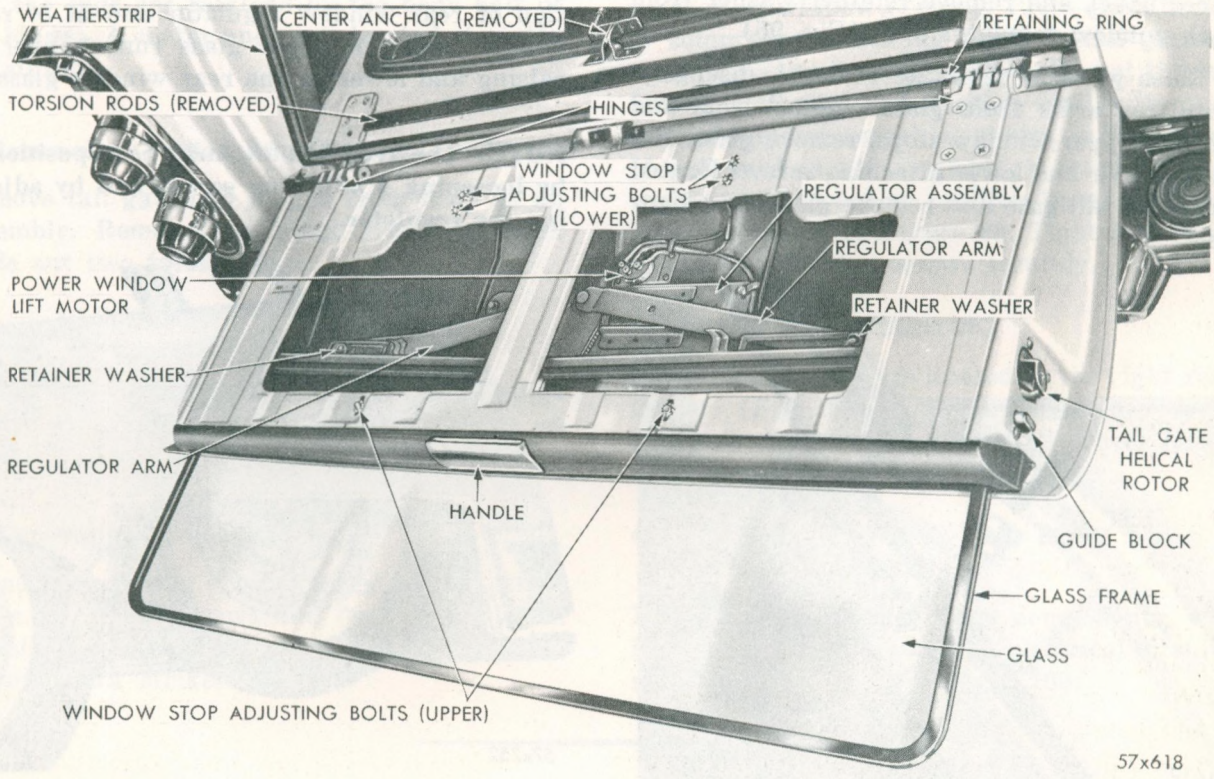


Fig. 95—Tail Gate Assembly

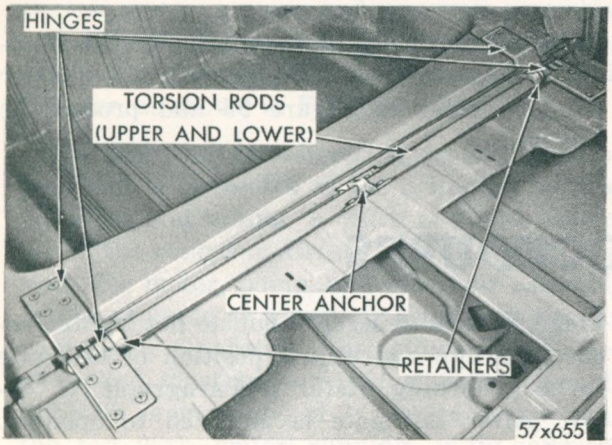


Fig. 96—Tail Gate Torsion Bars Installed

41. REMOVAL OF TAIL GATE REGULATOR HANDLE

Lower rear window glass. Remove regulator handle attaching screws, lower tail gate to open position and remove regulator handle.

42. REMOVAL OF TAIL GATE GLASS AND/OR RUN CHANNELS

Lower rear window glass, unlock and pull tail gate down to the fully opened position. Remove inner panel, and remove retainer washer from each window regulator arm (Fig. 95).

Raise glass to facilitate removal, disengage regulator arms from glass channel slots and remove upper window stops, remove glass. Remove upper and lower attaching screws located inside of tail gate and remove glass run channels.

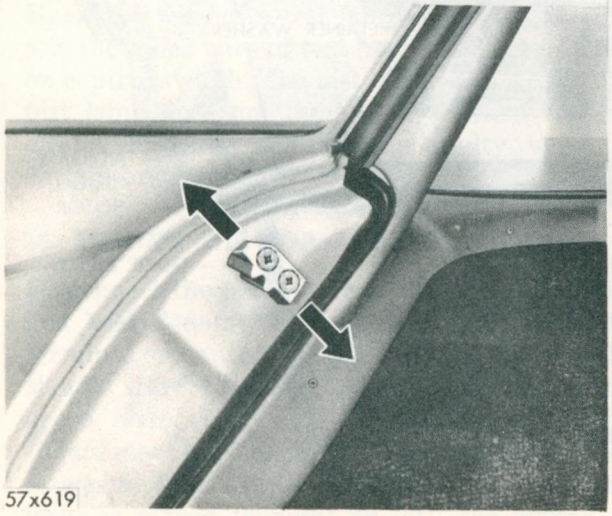


Fig. 97—Tail Gate Lock Striker

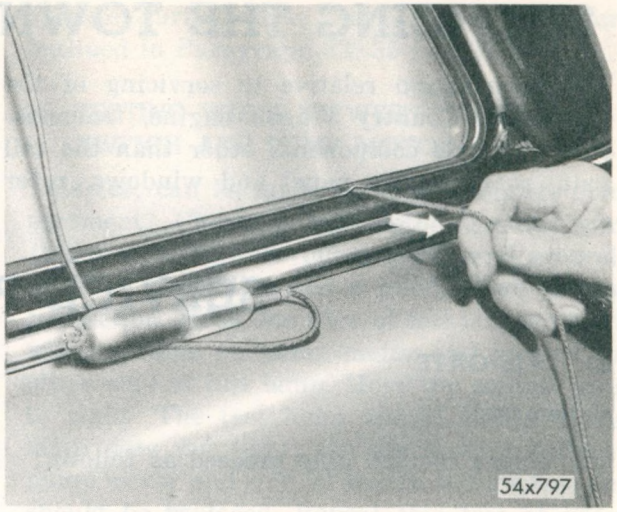


Fig. 98—Removing Pull Cord from Weatherstrip

43. INSTALLATION OF TAIL GATE LOWER GLASS RUN CHANNEL AND TAIL GATE GLASS

Install lower glass run channels and tighten screws securely Install rear window glass. Install upper stops. Slip regulator control arms into glass channel slots and install the retaining washers. Lower the tail gate glass to fully lowered position. Close tail gate. Check operation of rear window regulator and fit of rear window glass in upper glass run channel by raising and lowering the rear window glass.

NOTE: The rear window may be repositioned by loosening 4 adjusting screws and by adjusting the regulator.

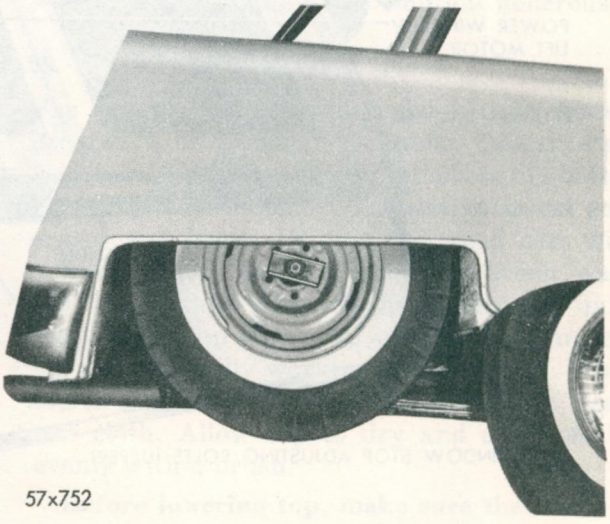


Fig. 99—Spare Wheel Mounting (Typical) C-75

If glass binds in channel, re-check adjustment. The tail gate glass run channel screws, two on each side of tail gate, are used to adjust fore and aft and tilt.

NOTE: If additional fore and aft adjustment is required at top of tail gate adjust lock strikers (Fig. 97).

44. Removal and Installation of Tail Gate Regulator

The tail gate regulator is bolted to the tail gate stress brackets by attaching bolts. Remove attaching bolts and remove regulator. The attaching bolt holes are elongated for proper aligning of regulator in relation to the glass travel.

When installing regulator, care should be taken to see that regulator is installed to permit total travel in both directions.

a. Torsion Bars

The tail gate is designed to assist the operator in opening and closing of the tail gate. The two torsion bars are located between the hinges and the ends are retained by the body half of the hinges. A center anchor is located at center of tail gate.

b. Removal of Torsion Bars (Fig. 96)

Remove tail gate and hinges from body as an assembly. Remove one hinge from tail gate. Slide out two torsion bars.

c. Installation

Install two torsion bars. (Fig. 96) Install hinge to tail gate. Install tail gate and hinges as an assembly.

d. Removal of Door Latch

Remove glass run channel (Fig. 95). Remove three attaching screws and door latch. When installing door latch make sure it is properly aligned with striker.

e. Replace Door Latch Pull Wire

Remove inner panel and replace wires. To adjust length of latch pull wire, loosen screw holding adjusting bracket (located under inner lip of door inner panel) and place wire in proper groove to apply tension. Tighten screws.

f. Removal Upper Glass Run Channel

Remove attaching screws and pry out channel from retaining strip.

45. REMOVAL AND INSTALLATION OF REAR QUARTER WINDOW

Remove rear quarter window garnish moulding attaching screws and remove garnish moulding. Exert pressure on the outside of glass and carefully force it out of opening.

Before installing the rear quarter window glass, remove old sealer from weatherstrip and window frame. Apply a bead of new sealer all around window opening. Install glass in the weatherstrip and insert pull cord in sealing lip slot, as shown in Figure 98. The pull cord should be installed so ends of cord are on bottom and outside of vehicle.

Slide window glass and weatherstrip into position in window opening. Press glass firmly to compress the sealing bead Install garnish moulding and attaching screws. Do not tighten screws. Pull cord and position sealing lip over edge of window reveal, as shown in Figure 98. If pull cord is not available, a wood or fiber wedge can be used to position lip of weatherstrip, as shown in Figure 98. Tighten garnish moulding attaching screws securely.

46. SPARE TIRE MOUNTING

Spare tire assembly is located in the right rear fender. (Fig. 99) To remove tire and wheel assembly, the fender skirt and wheel clamp must be removed.

47. INSTRUMENT PANEL AND BODY WIRING ASSEMBLY

For instrument panel, body components, wiring diagrams of the various electrical circuits, refer to Figures 100 through 105.

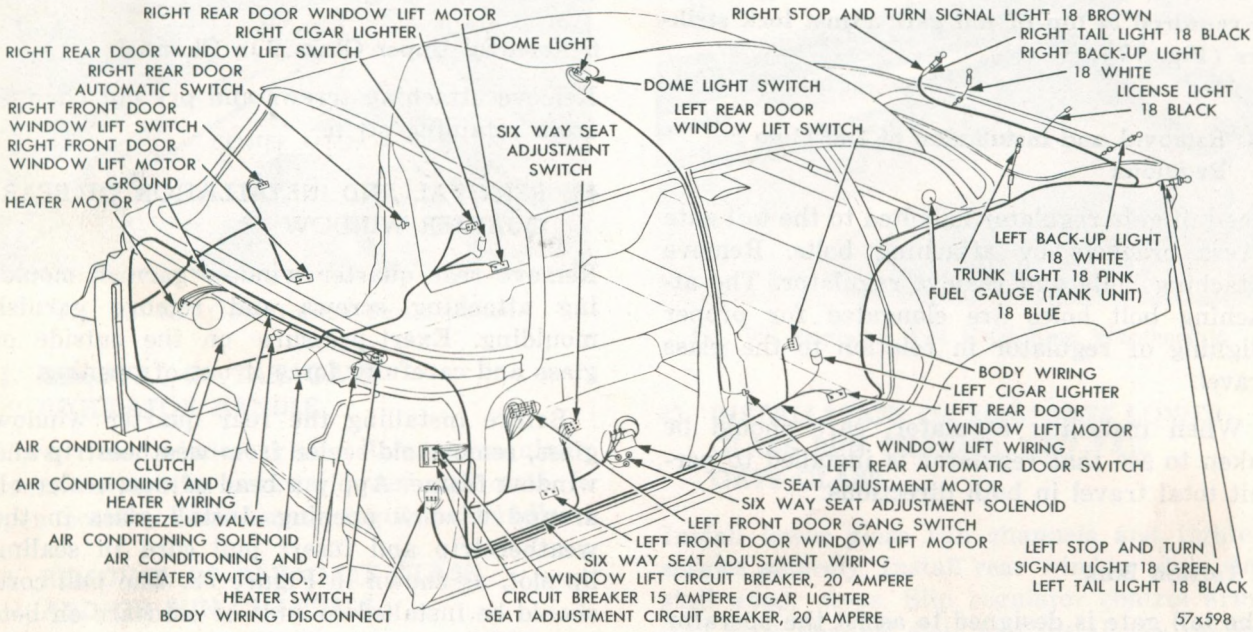


Fig. 100—Imperial Basic Body Wiring

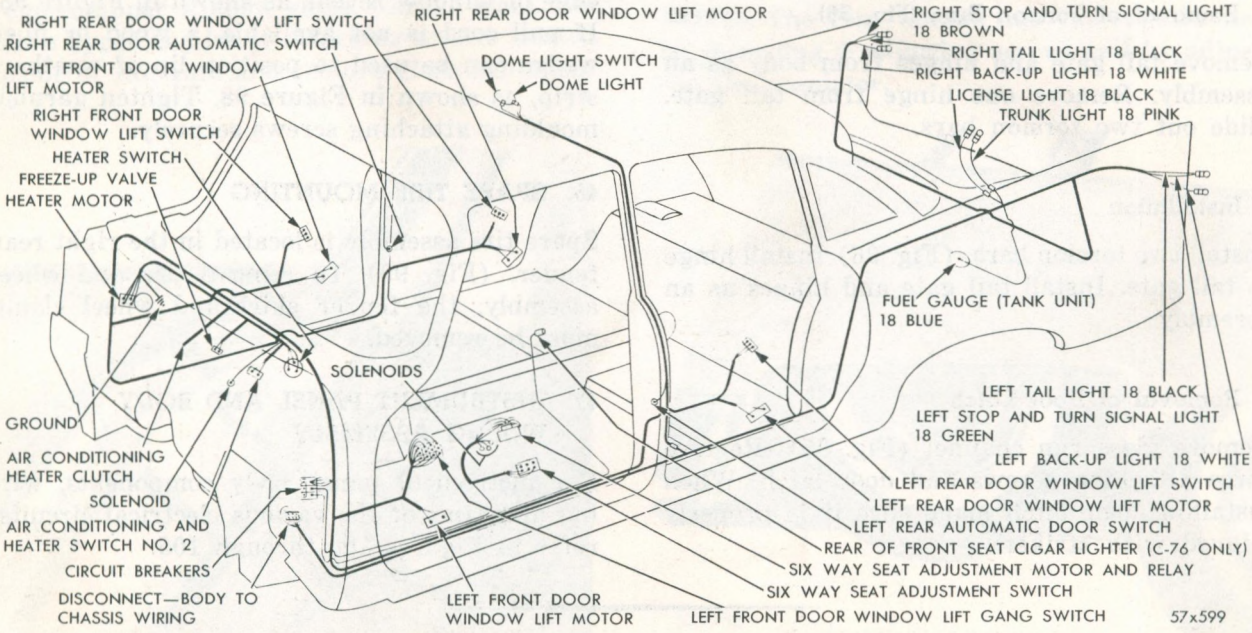


Fig. 101—C-75, C-76 Basic Body Wiring

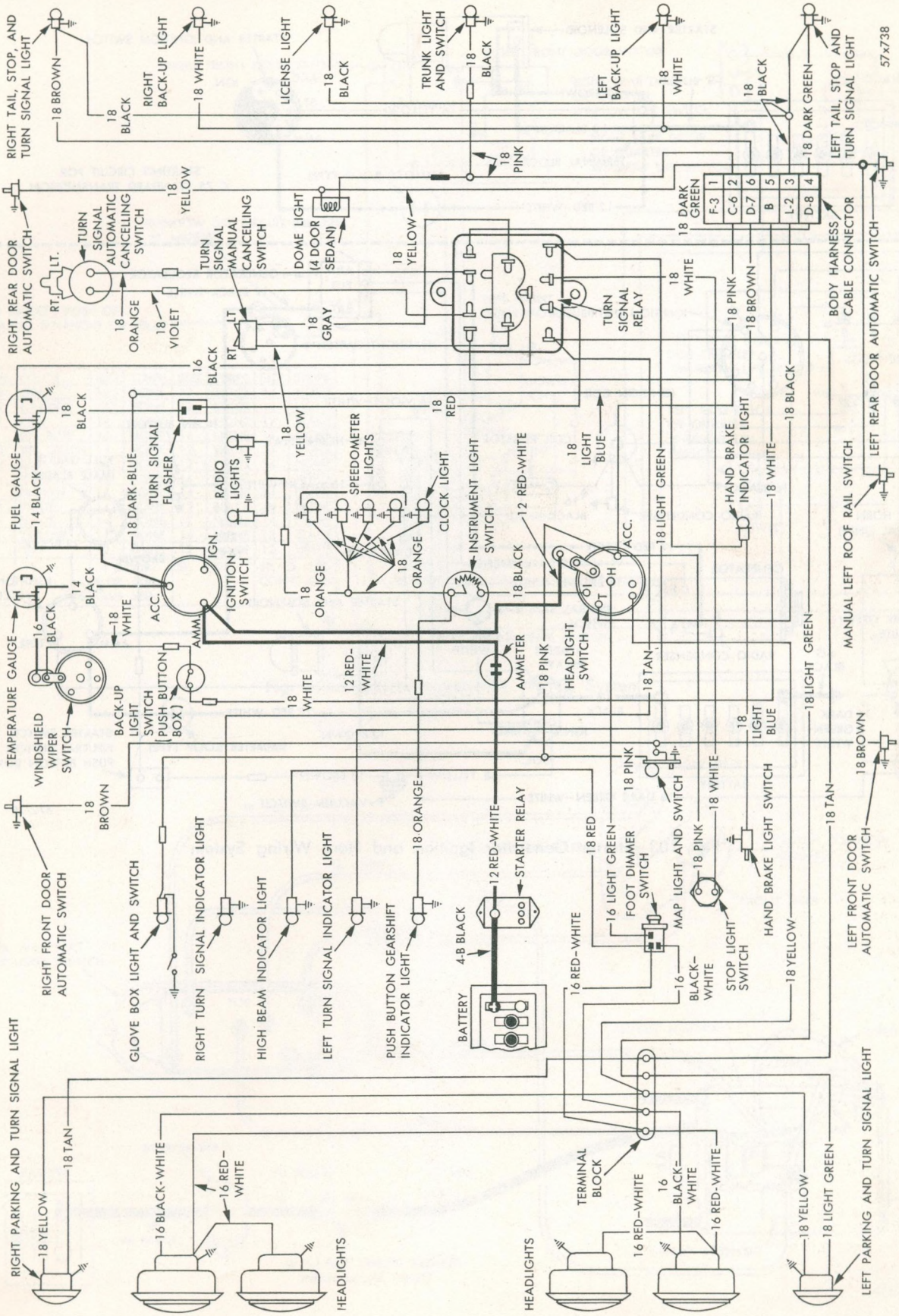


Fig. 102—Lighting and Turn Signal Wiring System

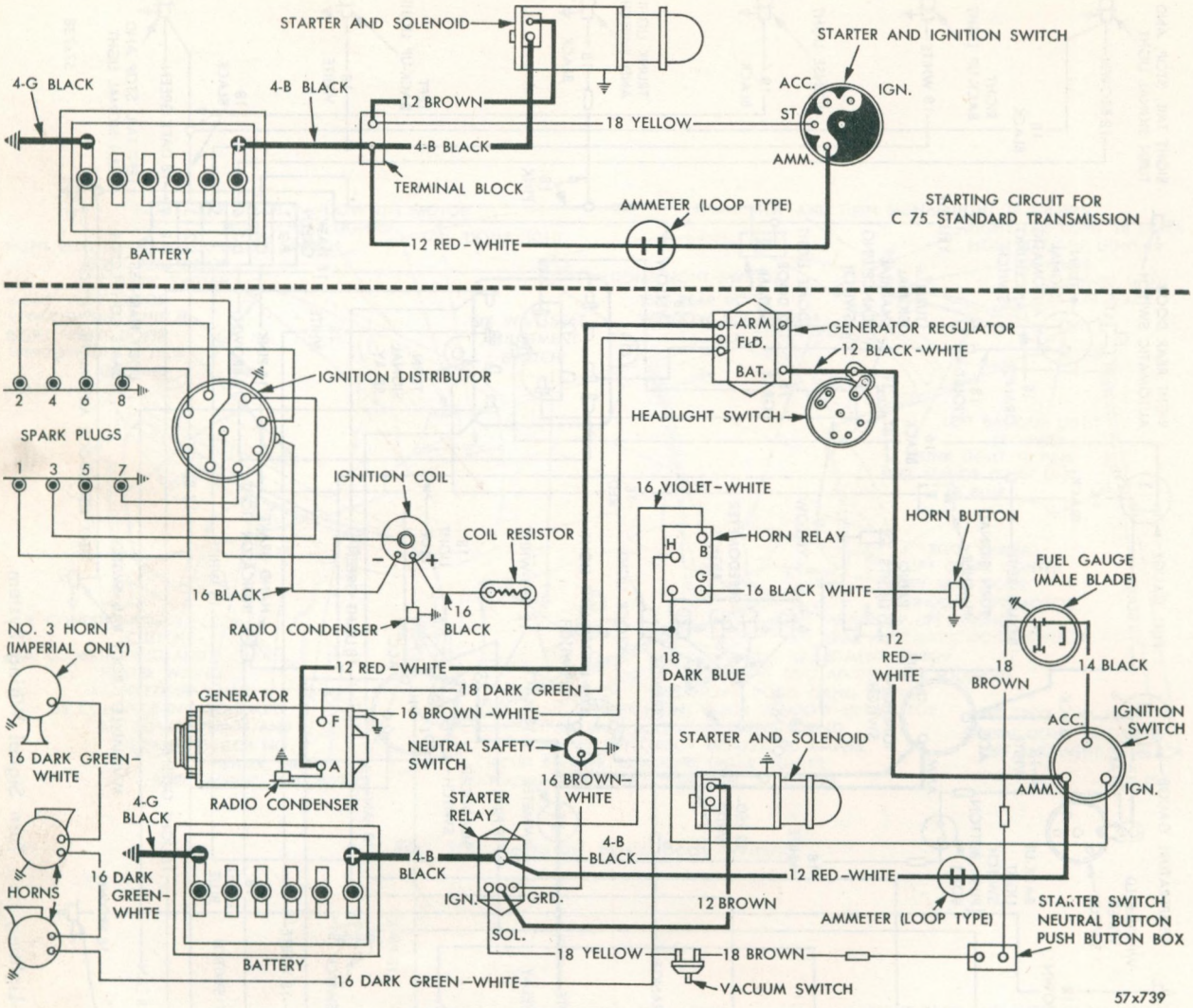
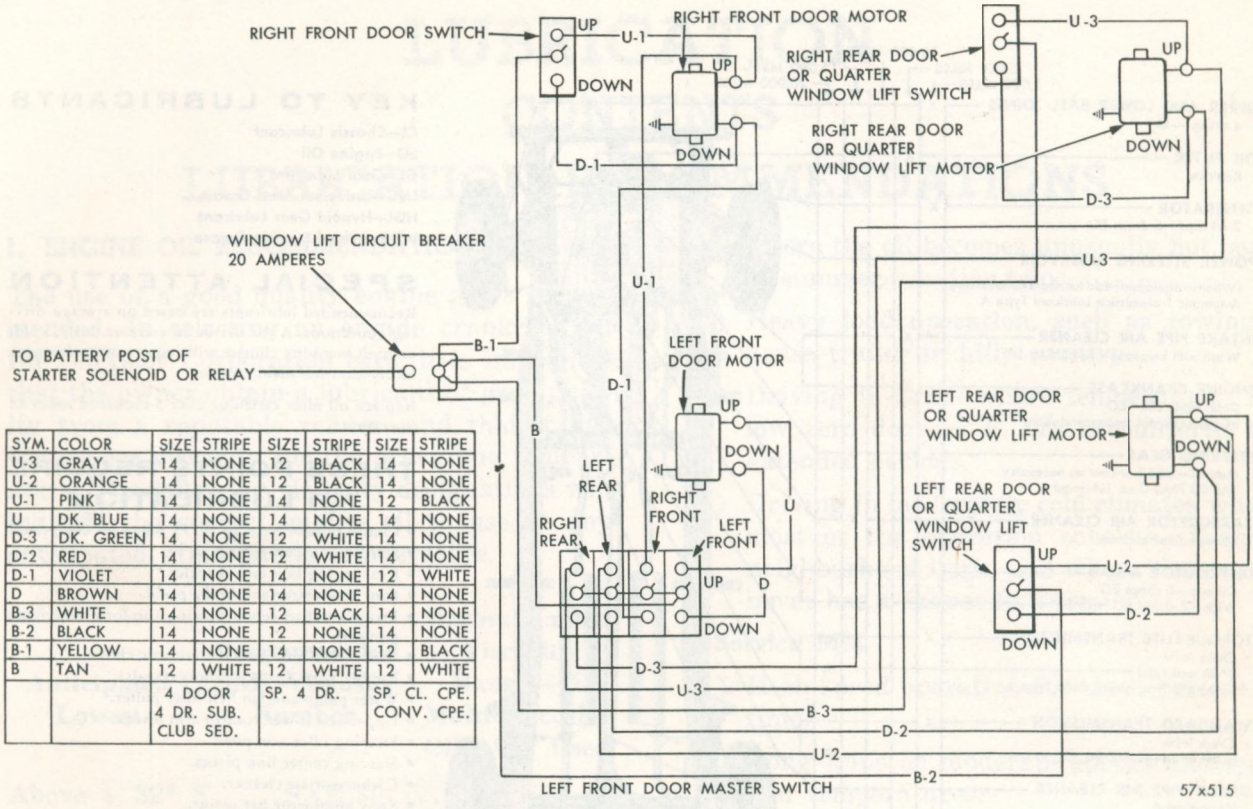


Fig. 103—Starter Generator Ignition and Horn Wiring System



SYM.	COLOR	SIZE	STRIPE	SIZE	STRIPE	SIZE	STRIPE
U-3	GRAY	14	NONE	12	BLACK	14	NONE
U-2	ORANGE	14	NONE	12	BLACK	14	NONE
U-1	PINK	14	NONE	14	NONE	12	BLACK
U	DK. BLUE	14	NONE	14	NONE	14	NONE
D-3	DK. GREEN	14	NONE	12	WHITE	14	NONE
D-2	RED	14	NONE	12	WHITE	14	NONE
D-1	VIOLET	14	NONE	14	NONE	12	WHITE
D	BROWN	14	NONE	14	NONE	14	NONE
B-3	WHITE	14	NONE	12	BLACK	14	NONE
B-2	BLACK	14	NONE	12	NONE	14	NONE
B-1	YELLOW	14	NONE	14	NONE	12	BLACK
B	TAN	12	WHITE	12	WHITE	12	WHITE
		4 DOOR 4 DR. SUB. CLUB SED.		SP. 4 DR.		SP. CL. CPE. CONV. CPE.	

Fig. 104—Electric Windowlift Wiring System

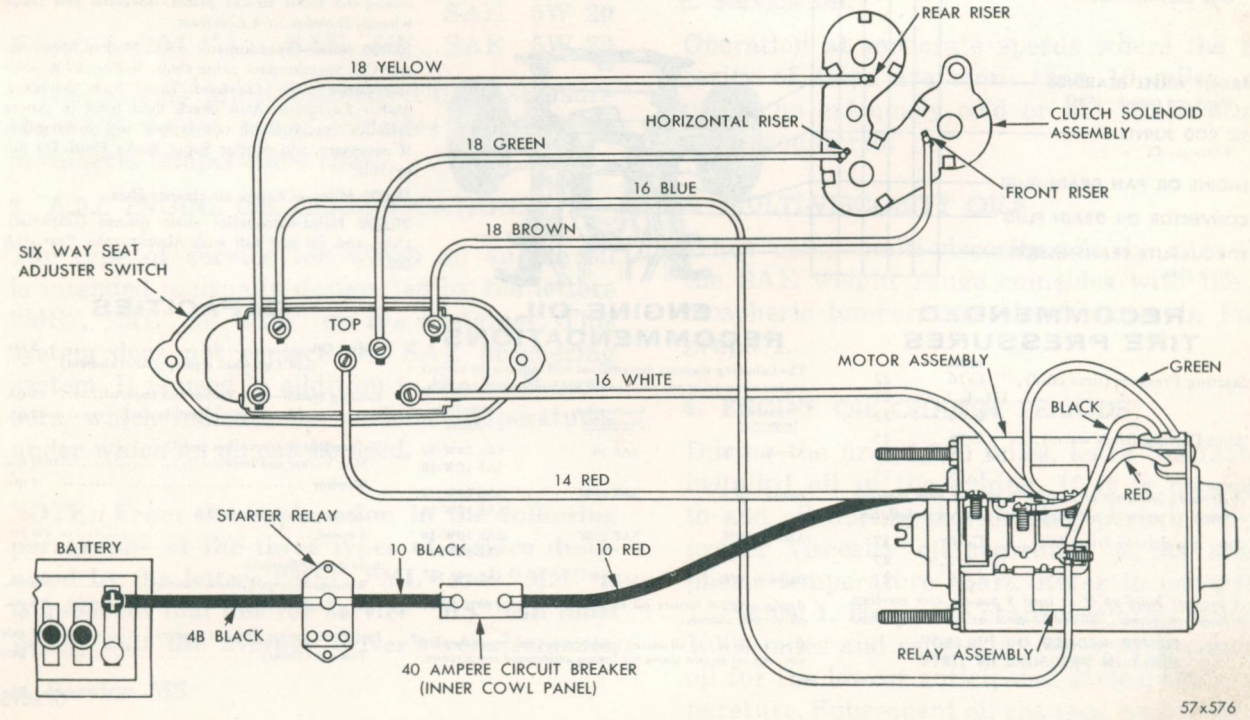
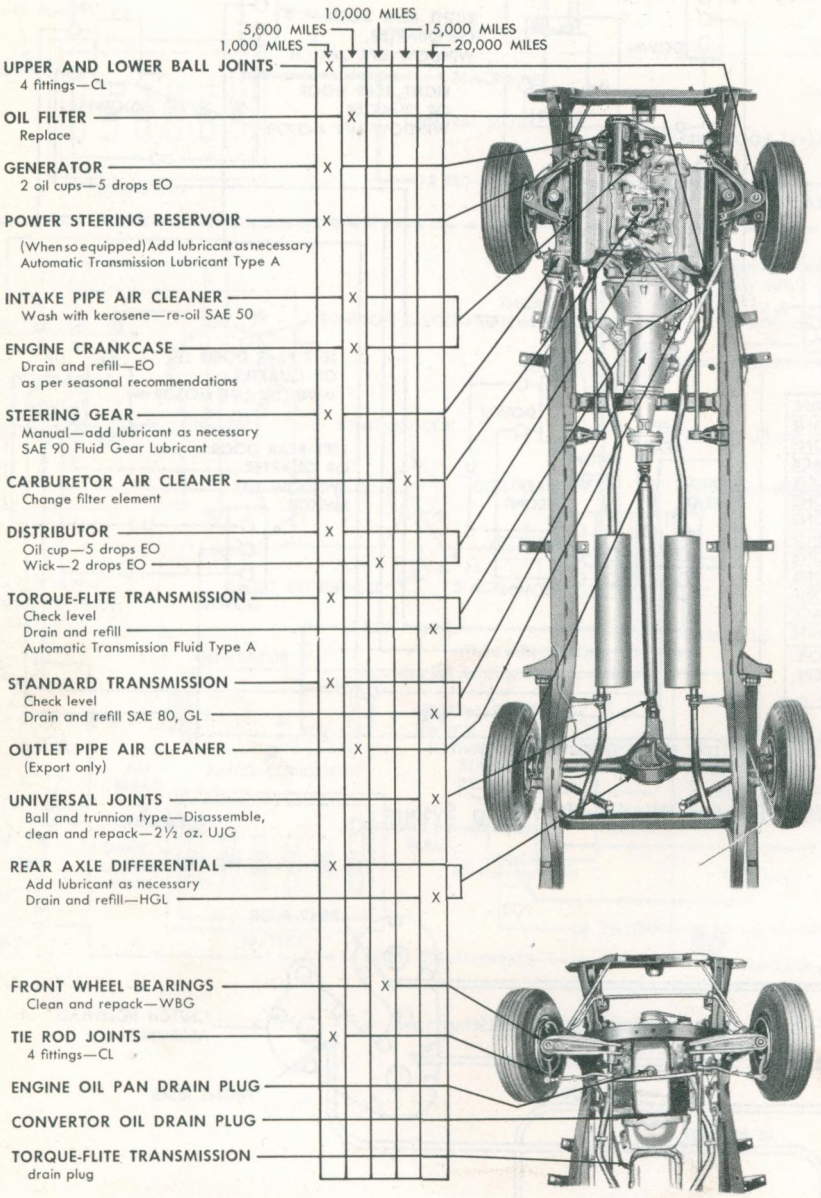


Fig. 105—6-Way Seat Adjuster Wiring Diagram



KEY TO LUBRICANTS

CL—Chassis Lubricant
EO—Engine Oil
GL—Gear Lubricant
UJG—Universal Joint Grease
HGL—Hypoid Gear Lubricant
WBG—Wheel Bearing Grease

SPECIAL ATTENTION

Recommended lubricants are based on average driving conditions. A car driven in extreme dusty, cold, or high humidity climate will require more frequent lubrication and maintenance.

Replace oil filter cartridge after 5-thousand miles of operation.

THESE POINTS REQUIRE NO LUBRICATION

- Clutch release bearing (C-75 when so equipped).
- Starting motor.
- Rear spring bolt and shackles.
- Foot accelerator and brake pedal.
- Propeller shaft center bearing (on long wheelbase models).
- Carburetor linkage and automatic choke.
- Rubber parts (pads, bushings, seals).
- Water pump and fan belt idler puller.
- Upper and lower control arm pivots.
- Steering idler arm pivot.
- Steering center link pivots.
- Carburetor air cleaner.
- Sway eliminator bar pivots.

ADDITIONAL LUBRICATION POINTS

1,000 Miles—Clutch torque shaft and gearshift control bell-crank, 2 fittings (C-75 when so equipped) CL; Parking brake linkage, *Lubriplate;* Door hinges and springs, hood clamps, etc., *MoPar Dripless Penetrating Oil;* Door striker plates, dovetails and rotor wheels, *Stainless Stick Lubricant.*

10,000 Miles—Speedometer wick, MoPar Speedometer Oil; Speedometer cable shaft, *MoPar All-Weather Speedometer Cable Lubricant;* Door lock cylinders, *MoPar Lubriplate.* Also check fluid level in power cylinder reservoir of convertible top mechanism. If necessary, add MoPar Super Brake Fluid. Do not overfill.

15,000 Miles—Change air cleaner filter.

20,000 Miles—Propeller shaft splines (Imperial), clean and fill half full with *Multi-purpose Rear Axle Oil.*

RECOMMENDED TIRE PRESSURES

	MODEL	
Starting Pressure (tires cold)..	C-76	22
	IM, 1, 2, 4	22
	C-75	22
After Driving (tires warm)....	C-76	25
	IM, 1, 2, 4	25
	C-75	25

A pressure build-up of at least 3 pounds over starting pressure is normal, otherwise tires are underinflated.

After fast driving (tires hot)...	C-76	27
	IM, 1, 2, 4	27
	C-75	27

A pressure build-up of at least 5 pounds over starting pressure is normal, otherwise tires are underinflated.

NEVER REDUCE OR "BLEED" BUILT-IN PRESSURE IN TIRES

ENGINE OIL RECOMMENDATIONS

The following viscosity designations will indicate the correct engine oil to use at any anticipated atmospheric temperature.

Atmospheric Temperature	Recommended Viscosity No.	Multi-Grade Options
Above..32°F.	SAE 30	SAE 20W-40 SAE 10W-30
Above..10°F.	SAE 20W	SAE 20W-40 SAE 10W-30
Above—10°F.	SAE 10W	SAE 10W-30 SAE 5W-20
Below—10°F.	SAE 5W	SAE 5W-20

Retain original factory oil in crankcase during first 1,000 miles of operation.

If necessary to add oil during initial period, use recommended viscosity oil shown above for lowest anticipated temperature.

CAPACITIES

Engine Oil (add 1 qt. when replacing filter element)	5 qts.
Cooling System—New Yorker and Imperial	25 qts.
Windsor (with heater)	22 qts.
Torque-Flite Transmission (refill)	
New Yorker and Imperial	10½ qts.
Windsor	9 qts.
Transmission—Standard Shift	
3-Speed	2¾ pts.
Rear Axle Differential	
Windsor (except Town & Country)	3½ pts.
New Yorker, all Town & Country and Imperial	3½ pts.
Fuel Tank (except Town & Country)	23 gals.
Town & Country	22 gals.

57x398

Fig. 1—Chrysler Engineered Lubrication

Section XV
LUBRICATION
CONTENTS
LUBRICATION RECOMMENDATIONS

1. ENGINE OIL RECOMMENDATIONS (FIG. 1)

The use of a good quality engine oil is recommended. In selecting an engine crankcase oil for Chrysler Corporation cars, it is important that the owner obtain a lubricant of good quality from a reputable refiner, and that it has the proper viscosity for the prevailing temperature. The following viscosity designations will indicate the correct engine oil to use at any anticipated atmospheric temperature.

Anticipated Lowest	Recommended SAE Viscosity Number	Recommended Viscosity Range—if Multi-Viscosity Oils Are Used
Above + 32° F.	SAE 30	SAE 20W 40 SAE 10W 30
Above + 10° F.	SAE 20W	SAE 20W 40 SAE 10W 30
Above (—10° F.)	SAE 10W	SAE 10W 30 SAE 5W 20
Below (—10° F.)	SAE 5W	SAE 5W 20

When using Multi-Viscosity Oils, make sure the SAE weight range coincides with the atmospheric temperature chart.

2. A.P.I. ENGINE OIL CLASSIFICATIONS

The type of service for which an engine oil is intended is usually designated by the letters "MS", "ML" or "MM" on the container. This system does not replace the SAE numbering system. It is used in addition to the SAE numbers, which indicate the various temperatures under which an oil can be used.

NOTE: From the explanation in the following paragraphs of the three types of service designated by the letters "MS", "ML" and "MM" it is apparent that oils for service "MS" will most nearly suit the average driver's requirements.

a. Service MS

(1) Continuous high speed highway driving where the oil becomes unusually hot, such as summer vacation trips.

(2) Heavy load operation, such as towing a house trailer in hilly country.

(3) Driving in areas where temperatures below zero degrees F. are encountered for extended periods.

(4) Driving in moderately cold climates where most of the operation consists of short neighborhood trips, and where the engine never has a chance to warm up.

b. Service MM

(1) High speed operation for short periods of time.

(2) Long trips at moderate speeds and summer temperatures.

(3) Operation in moderately cold air temperatures where frequent long trips, as well as short trips, are included.

c. Service ML

Operation at moderate speeds where the majority of trips are more than 10 miles, and where no extremely cold or hot temperatures are encountered.

3. MULTI-VISCOSITY OILS

When using multi-viscosity oils, be sure that the SAE weight range coincides with the atmospheric temperature chart shown in Paragraph 1.

4. ENGINE OIL CHANGE PERIODS

During the first 1,000 miles, leave the factory installed oil in the engine. If it is necessary to add oil during this driving period, use the proper viscosity oil according to the atmospheric temperature chart. Refer to paragraph 1, Figure 1. Drain the crankcase after the first 1,000 miles and refill with the proper viscosity oil for the lowest anticipated atmospheric temperature. Subsequent oil changes, under normal driving conditions, should be made every 5,000

miles—more often if winter driving consists of short trips, or extreme dust or contaminated atmospheric conditions are encountered. Five quarts of engine oil are necessary for refill. Add an additional quart when the oil filter element is changed. The oil level indicator is located on the left side of the engine.

5. UNUSUAL CONDITIONS

Under certain conditions, more than usual care is advisable in order to keep the engine operating smoothly. In cold weather, for example, the car should be driven at moderate speeds until the engine reaches normal operating temperature. Short trips, in which the engine does not reach normal operating temperature, may result in condensation forming in the oil pan. To protect the engine against this condition, the engine oil and the oil filter element should be changed more frequently than recommended in the regular service schedule. When driving over dusty roads for extended periods, the lubrication interval should be shortened and the carburetor air cleaner, crankcase ventilator air cleaner and oil filter should be serviced more frequently.

6. ENGINE OIL LEVEL INDICATOR

The engine oil level should be checked each time the car is refueled. The engine oil level indicator, as shown in Figure 2, has two markings:

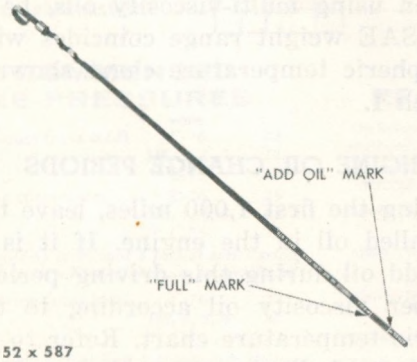


Fig. 2—Typical Engine Oil Level Indicator

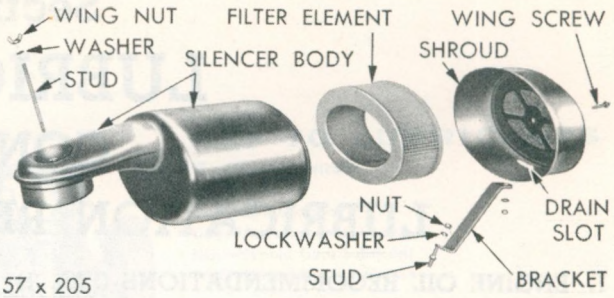


Fig. 3—Air Cleaner

"Full" and "Add Oil". If the oil level is between the "Full" and "Add Oil" marks, it is not necessary to add oil. If the oil level drops to the "Add Oil" mark, or slightly below it, add not more than one quart of oil.

7. CARBURETOR AIR CLEANER

The carburetor air cleaner, as shown in Figure 3, is a heavy duty type air cleaner with a replaceable paper element and is used on all models. At 5,000 miles interval, the paper element should be removed, tap the dirt out with your hand gently and replace. **DO NOT WASH OR OIL.** When car is driven in dusty areas, the air cleaner may require more frequent servicing. Install a new MOPAR filter cartridge every 15,000 miles.

8. OIL FILTER

The full-flow oil filter with replaceable element is used on the Windsor, New Yorker and Imperial models. The oil filter element should be changed every 5,000 miles to coincide with an engine oil change, after the initial engine oil change.

During cold weather operation, or when the car is driven in dusty areas, more frequent replacement of the oil filter element may be necessary.

9. OIL FILTER PIPE CAP AIR CLEANER

At every 5,000 miles interval, the air cleaner should be removed, thoroughly cleaned in kerosene, and re-oiled with SAE 50 Engine Oil. (SAE 40 may be used if SAE 50 is not available). When car is driven in dusty areas, the air cleaner may require more frequent servicing.

LUBRICATION RECOMMENDATIONS

10. EVERY 1,000 MILES

Refer to Lubrication Chart as shown in Figure 1, for lubrication points, lubrication procedures and lubricants, also, refer to the following.

a. Manual Steering Gear

Check lubricant level at the above mileage and replenish when level is below filler hole. Do not use pressure gun! Use SAE 90 Fluid Gear Lubricant. In extremely cold weather, use SAE 80 Fluid Gear Lubricant, or dilute SAE 90 with small amount of SAE 10-W engine oil to ease steering.

b. Power Steering

The level of the oil in reservoir will vary according to the operating temperature of the pump. The normal operating temperature is approximately 175 degrees F. At 70 degrees F., the oil level will be approximately 3¼ inches below the top of the filler neck. The oil level should never be allowed to fall below the baffle on the reservoir.

Whenever the pump is drained or removed for servicing, the pump must be filled up to the "full" mark indicated on the filler neck of reservoir before and after the engine is started. Use Automatic Transmission Fluid, Type "A".

NOTE: Maintain fluid level in pump as recommended and replenish as necessary with specified lubricant. When reservoir cover is removed, do not permit dirt to fall into reservoir. It is not necessary to change the fluid for cold weather operation.

c. Rear Axle

Use Multi-Purpose Hypoid Gear Lubricant SAE 90 for summer and winter above —10° F., or SAE 80 for extreme winter below —10° F. Remove filler plug and check level of lubricant. Replenish to level of filler plug hole. Do not overfill!

d. 3-Speed Transmission (Car So Equipped)

Use SAE 10-W Engine Oil, at all temperatures. Remove filler plug and check lubricant level. Replenish to level of filler plug hole.

e. TorqueFlite Transmission—

Checking Fluid Level

Apply parking brakes. Run engine at idle speed and operate the drive selector lever through all ranges and return to Neutral (N). Check level at transmission dipstick. Replenish to "L" mark if level is below the "L" mark when engine and transmission are cold; if, after operating the car for several miles, the level is below the "F" mark, replenish to the "F" mark. The oil level however should not be above the Full mark after the car has been driven sufficiently to bring the engine and transmission up to operating temperatures.

f. Special Low Temperature Recommendation

If it is anticipated that the average temperature range will be below (—10°) F., replace one quart of fluid with refined kerosene. This service need be performed once at the beginning of the low temperature season. Thereafter, necessary replenishment of TorqueFlite should be with Automatic Transmission Fluid, Type "A", until the next seasonal dilution or the 20,000 mile oil change.

CAUTION

To prevent dirt from entering the transmission, make sure the oil level indicator is properly seated in the filler tube.

g. Generator

There are two oil cups. Apply 5 to 10 drops of Light Engine Oil to each oil cup.

h. Distributor

Use 5 to 10 drops of Light Engine Oil in oil cup.

11. EVERY 5,000 MILES

Refer to Lubrication Chart, as shown in Figure 1, "Higher Mileage Services (5,000 Miles)." Also, refer to Paragraphs 3, 4, 5 and 6.

12. EVERY 10,000 MILES

Refer to Lubrication Chart as shown in Figure 1, "10,000 Miles Interval," and also to the following information:

a. Front Wheel Bearings

Use Short Fiber Wheel Bearing Grease—Medium. Check quality and quantity of lubricant.

NOTE: DO NOT ADD GREASE TO WHEEL BEARINGS. If grease is emulsified or in short quantity, it should be replaced. All grease should be removed from the bearings and hub, and the assembly cleaned and repacked. Add 2¼ ounces of lubricant to inner surface of hub on models C-75, C-76 only. Add 4½ ounces of lubricant to inner surface of hub on models IM-1, 2 and 4.

b. Speedometer Oil Tube Wick

Use MOPAR Speedometer Oil. Unscrew and remove oil tube with wick from speedometer housing (above speedometer cable flange). Saturate wick, as shown in Figure 4, with oil and replace.

c. Speedometer Cable

Use MOPAR All-Weather Speedometer Cable Lubricant. Disconnect cable at speedometer housing, as shown in Figure 4, and remove shaft. Coat shaft with the specified lubricant and install.

d. Distributor

Use Light Engine Oil and MOPAR Cam Lubricant. Remove distributor rotor and apply 2 or 3 drops of Light Engine Oil to felt wick in top of cam. When replacing contact points, apply MOPAR Cam Lubricant to bumper block on distributor contact arm. Do not permit oil or lubricant to get on contact points!

13. EVERY 15,000 MILES

Refer to Lubrication Chart, as shown in Figure 1, "15,000 Miles Interval."

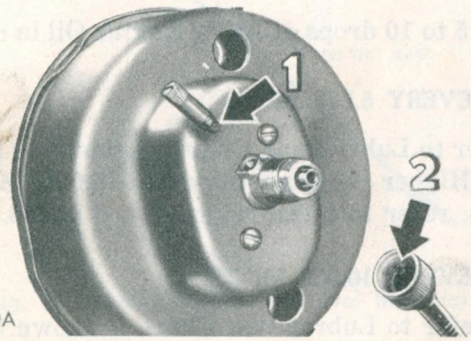


Fig. 4—Speedometer and Cable Lubrication Points (Unit positioned to Show Lubrication Points)

14. EVERY 20,000 MILES

Refer to Lubrication Chart, as shown in Figure 1, "20,000 Miles," and also to the information that follows:

a. 3-Speed Transmission

Use SAE 80 Fluid Gear Lubricant. Drain and refill. Keep level at bottom of filler plug hole. In warm area where SAE 80 Fluid Gear Lubricant is not available, SAE 90 may be used. To refill, remove transmission drain plug hole and allow unit to drain. Fill transmission to level of filler plug hole with 2¾ pints of specified lubricant. Check level of unit and add lubricant, if necessary.

b. TorqueFlite Transmission

Use Automatic Transmission Fluid, Type "A." To drain, remove the filler tube connector at the oil pan, as shown in Figure 5. Pull back on tube to drain. Retighten connector when drained. Remove access plate from bottom of housing and rotate torque converter until drain plug is accessible. Remove the plug and drain the fluid. Check the gasket on torque converter and install new gaskets, if necessary. Install drain plug and tighten. Install access plate on housing and tighten screws. To refill, apply parking brake. Add 5 quarts of Automatic Transmission Fluid, Type "A" through transmission oil pan filler tube. Start engine and add approximately 4 more quarts while engine is running. Allow engine to idle for 2 minutes.

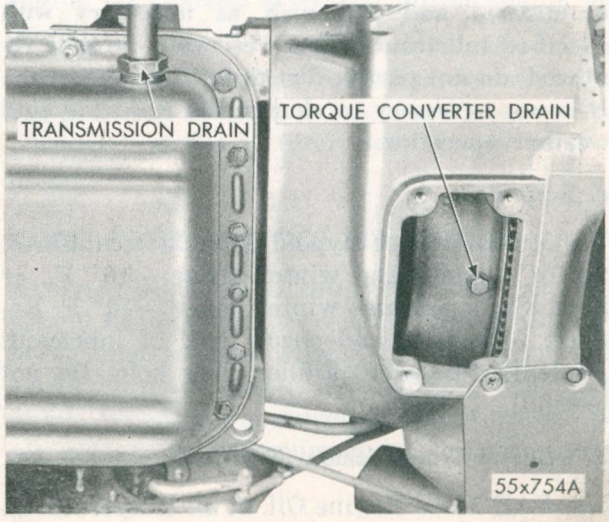


Fig. 5—TorqueFlite Transmission and Torque Converter Drain Points

Operate the TorqueFlite Transmission drive selector push buttons through all speed ranges and push in the Neutral (N) push button. Add sufficient fluid to bring fluid level to Low mark on transmission dip stick.

CAUTION

To prevent dirt from entering transmission, make sure dip stick is properly seated in filler tube.

15. PARTS REQUIRING NO LUBRICATION

Refer to Lubrication Chart, as shown in Figure 1, and to the following information:

a. Rubber Bushings

Do not lubricate these bushings. They are designed to grip the contracting metal parts firmly and operate as a flexible medium between these parts. The use of any lubricant will destroy the necessary friction and cause premature failure of these rubber parts.

b. Oilite Bearings

The bearings are self-lubricating and are used in locations where lubrication is difficult to maintain. When Oilite Bearings are subjected to heat or pressure, oil seeps to the surface of the bearings to provide necessary lubrication.

Oilite Bearings are available in standard sizes and can be burnished to a final running fit. They should not be reamed, filed or otherwise cut to size. If replacement is necessary, install a new Oilite Bearing of the same size.

Section XVI

RADIO, HI-FI AND HEATER

CONTENTS

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RADIO

The Electro Touch-Tuner (Model 920 HR) (Fig. 1) and 921 HR (1M) (Fig. 2), have six tubes and one transistor. It includes a variable tone control with manual tuning, push button tuning and automatic search tuning. The Music Master (Model 847) (Fig. 3) has five tubes and one transistor. It includes a variable tone control with manual tuning and push button tuning.

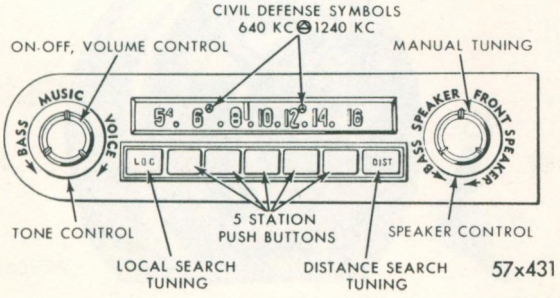

Fig. 1—Operating Controls 920HR

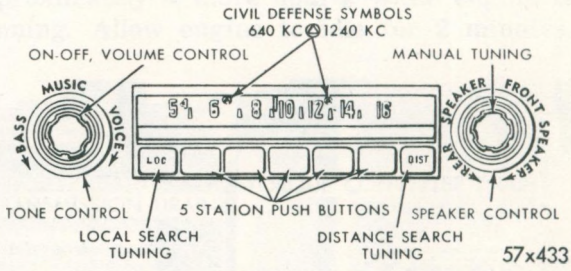

Fig. 2—Operating Controls 921HR

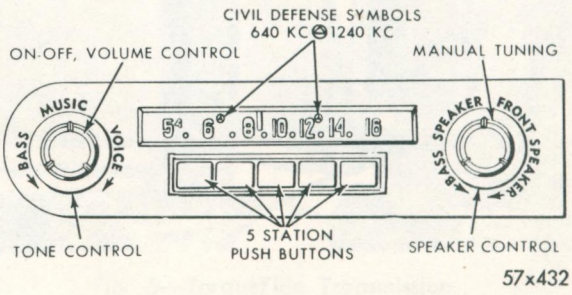

Fig. 3—Operating Controls 847

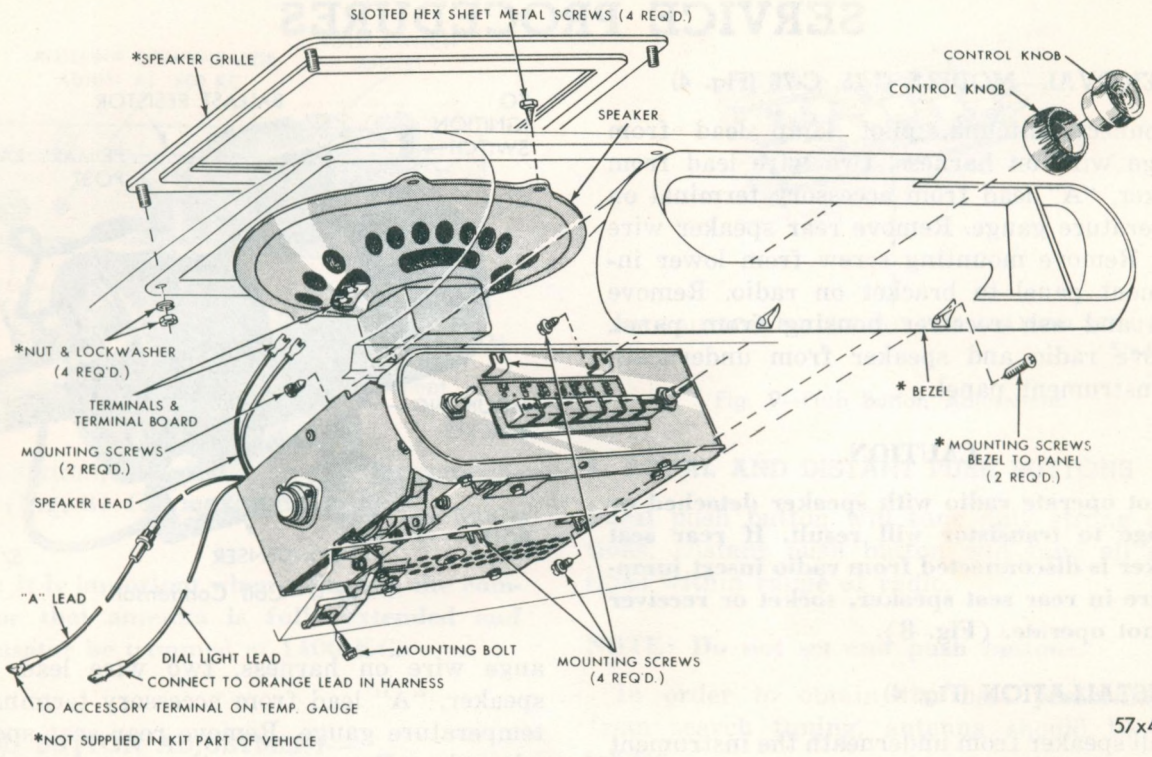

Fig. 4—Radio Model 920HR Typical of Model 847

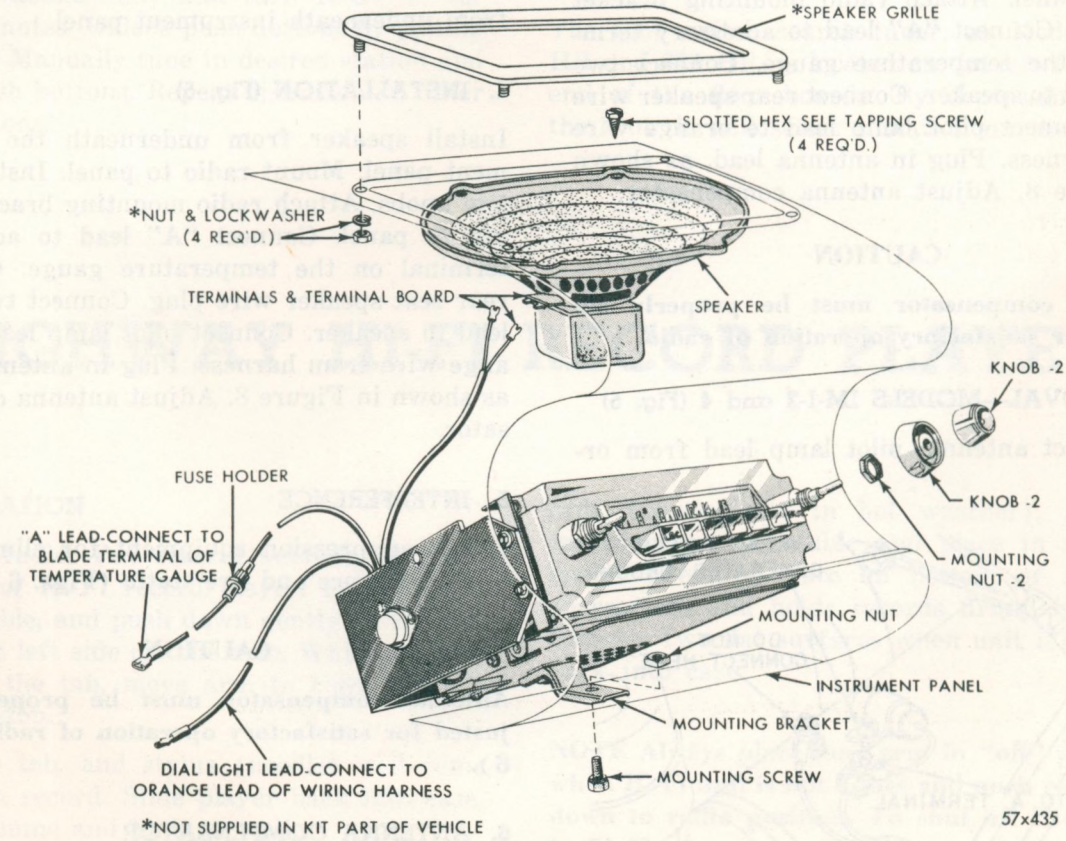

Fig. 5—Radio Model 921HR

SERVICE PROCEDURES

1. REMOVAL—MODELS C-75, C-76 (Fig. 4)

Disconnect antenna, pilot lamp lead from orange wire on harness, two wire lead from speaker, "A" lead from accessory terminal on temperature gauge. Remove rear speaker wire plug. Remove mounting screw from lower instrument panel to bracket on radio. Remove radio and ash receiver housing from panel. Remove radio and speaker from underneath the instrument panel.

CAUTION

Do not operate radio with speaker detached or damage to transistor will result. If rear seat speaker is disconnected from radio insert jumper wire in rear seat speaker, socket or receiver will not operate. (Fig. 8).

2. INSTALLATION (Fig. 4)

Install speaker from underneath the instrument panel. Mount radio to radio and ash receiver housing. Install radio and ash receiver housing in the panel. Attach radio mounting bracket to panel. Connect "A" lead to accessory terminal on the temperature gauge. Connect two wire lead to speaker. Connect rear speaker wire plug. Connect pilot lamp lead to orange wire from harness. Plug in antenna lead, as shown in Figure 8. Adjust antenna compensator.

CAUTION

Antenna compensator must be properly adjusted for satisfactory operation of radio.

3. REMOVAL—MODELS IM-1-2 and 4 (Fig. 5)

Disconnect antenna, pilot lamp lead from orange wire on harness, two wire lead from speaker, "A" lead from accessory terminal on temperature gauge. Remove rear seat speaker wire plug. Remove mounting nut from lower instrument panel to bracket on radio. Remove radio control knobs. Remove radio and speaker from underneath instrument panel.

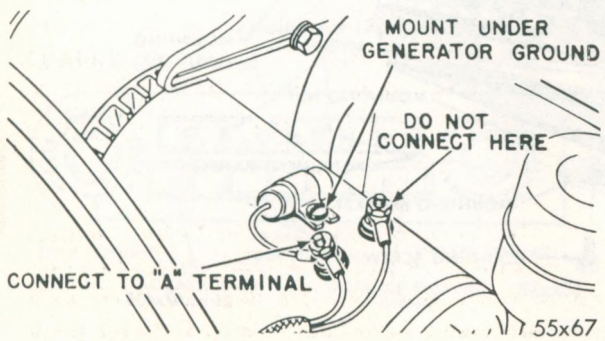

Fig. 6—Generator Condensor

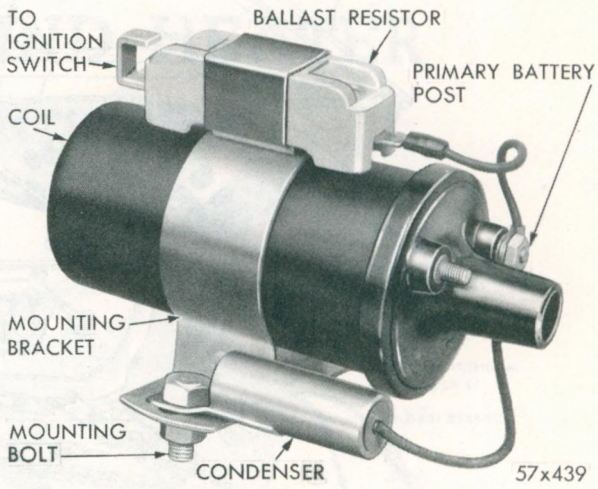

Fig. 7—Coil Condensor

4. INSTALLATION (Fig. 5)

Install speaker from underneath the instrument panel. Mount radio to panel. Install control knobs. Attach radio mounting bracket and nut to panel. Connect "A" lead to accessory terminal on the temperature gauge. Connect rear seat speaker wire plug. Connect two wire lead to speaker. Connect pilot lamp lead to orange wire from harness. Plug in antenna lead, as shown in Figure 8. Adjust antenna compensator.

5. INTERFERENCE

Install suppression equipment for elimination of interference and tire static (Figs. 6 and 7).

CAUTION

Antenna compensator must be properly adjusted for satisfactory operation of radio (Fig. 8).

6. ANTENNA COMPENSATOR

Extend antenna fully, tune radio manually to

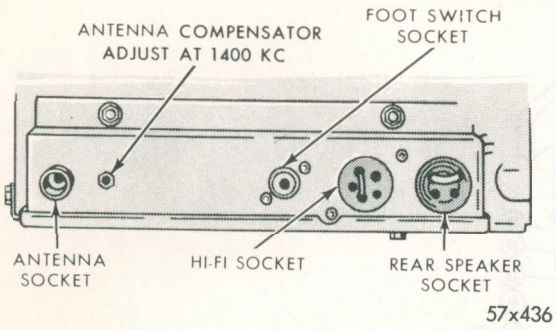

Fig. 8—Antenna Compensator Adjustment

a weak station, 1400 KC, turn antenna compensator, (Fig. 8) for maximum volume.

NOTE: It is important when adjusting the compensator that antenna is fully extended and compensator be trimmed at 1400 KC.

7. PUSH BUTTON ADJUSTMENT— MODELS 920HR-847—921HR (Fig. 9)

Extend antenna fully and turn radio on for fifteen minutes. Unlock push buttons by pulling them out. Manually tune in desired station and relock push buttons. Repeat operation on other push buttons.

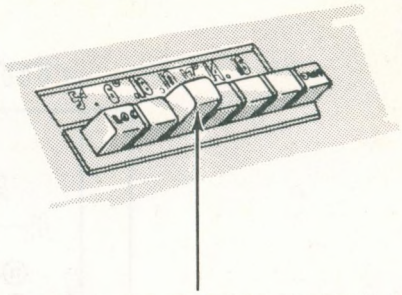

Fig. 9—Push Button Adjustment

8. LOCAL AND DISTANT PUSH BUTTONS

Local push button will tune only strong stations. Distant push button will tune all stations within range of radio.

NOTE: Do not set end push buttons.

In order to obtain the best performance from search tuning, antenna should be extended.

9. FOOT SWITCH SEARCH TUNER

The foot switch search tuner, on Models 920 HR and 921 HR, is located on the left forward end of the floor boards. By depressing with the foot, it will select a station on the radio.

HIGHWAY HI-FI RECORD PLAYER

10. OPERATION

Turn on radio. Put control knob in "Phono" position, of Hi-Fi record player. Place record on turntable, and push down gently on red tab located on left side of tone arm. While pushing down on the tab, move arm to right until it contacts stop.

Release tab, and stylus (needle) will come to rest on record. Slide player back into case, adjust volume and tone on radio.

Care of Records—To prevent damage to records (particularly in hot weather), remove records from turntable and place in storage space. Pressure plate on bottom of storage space rises and holds records firmly in place between two flat surfaces when unit is pushed back into case.

NOTE Always place tone arm in "off" position when Hi-Fi unit is not in use and push red knob down to radio position. To shut off Hi-Fi unit in an emergency turn radio control to off position.

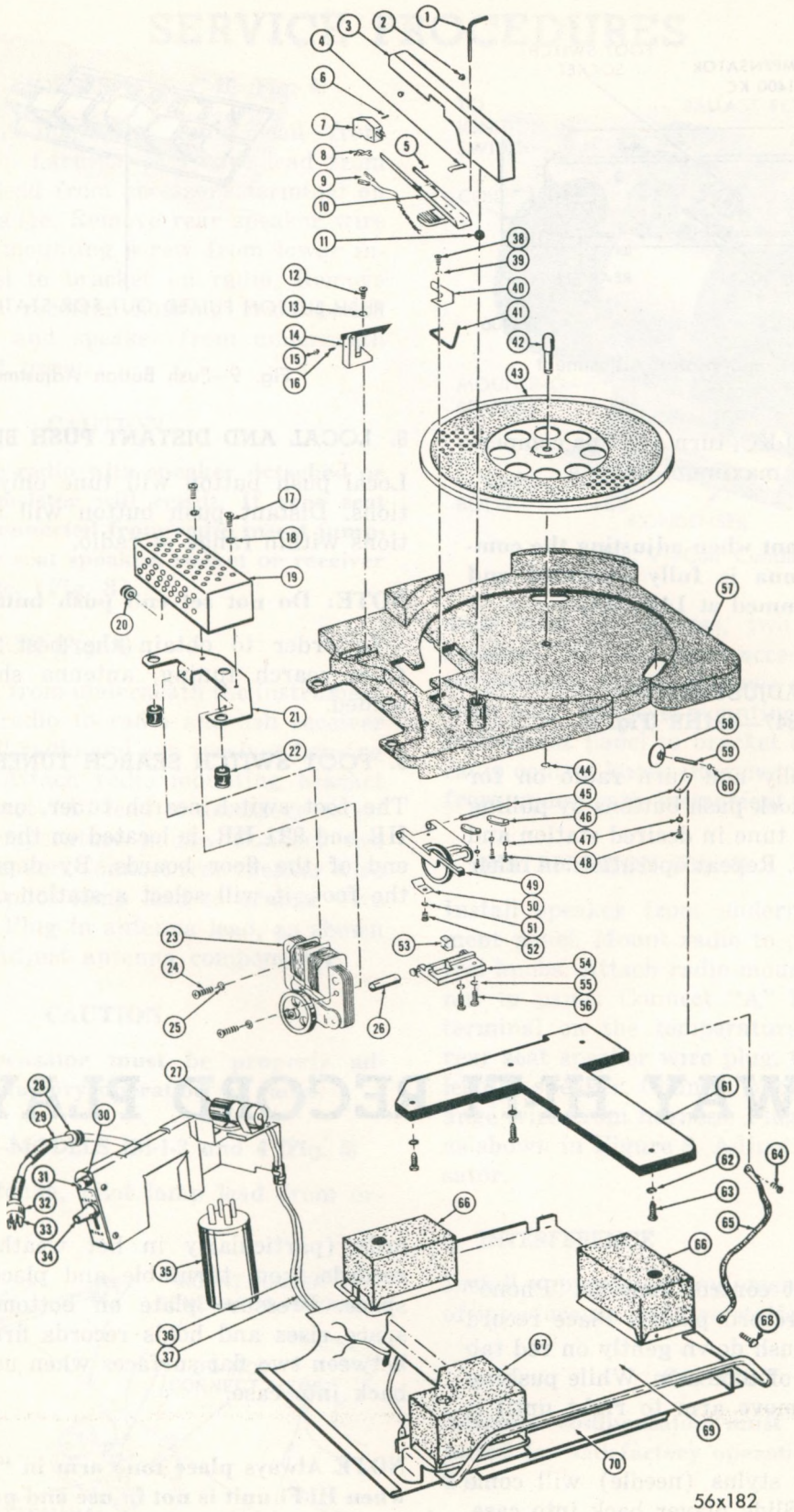

Fig. 10—Hi-Fi Record Player (Disassembled View)

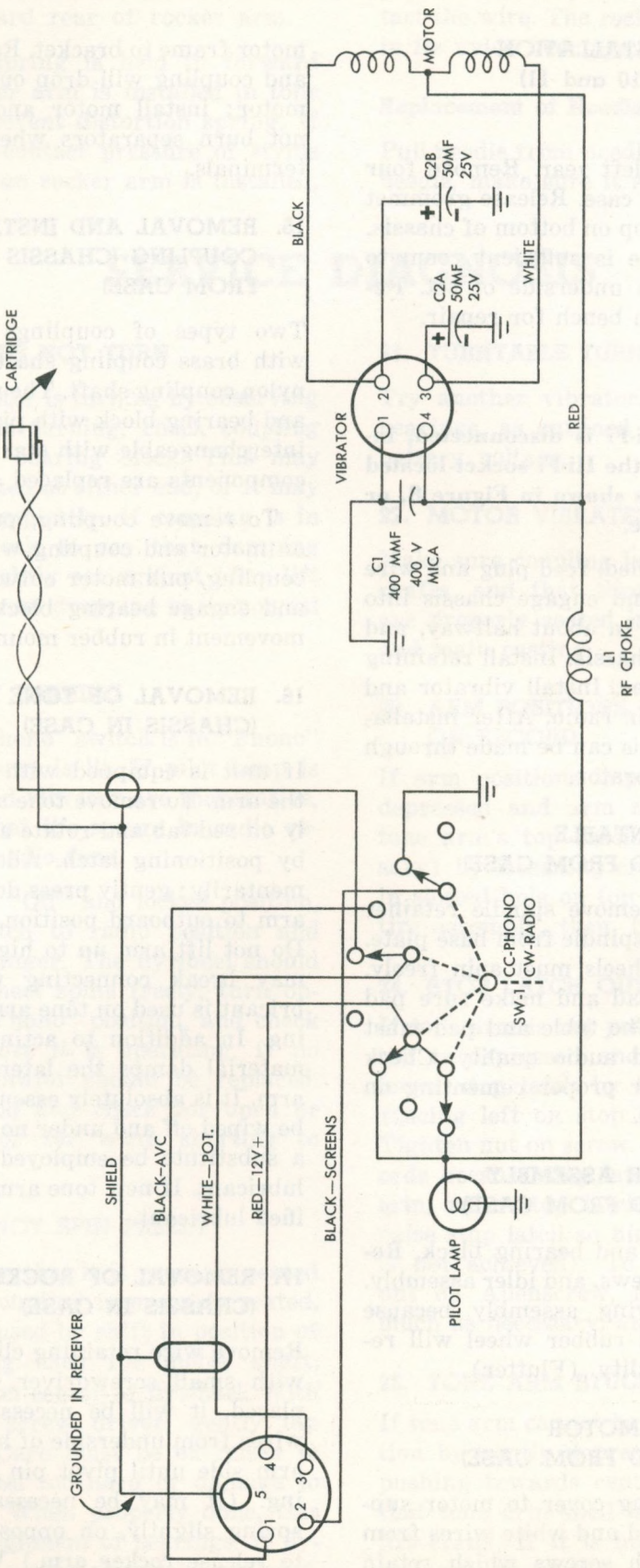

Fig. 11—Hi-Fi Record Player Electrical Circuit Wiring Diagram

SERVICE PROCEDURES

11. REMOVAL AND INSTALLATION OF CHASSIS (Figs. 10 and 11)

a. Removal

Remove vibrator from left rear. Remove four screws from left side of case. Release grommet on plug wire. Release stop on bottom of chassis, and pull out until there is sufficient room to remove ground wire on underside of set. Remove set and place it on bench for repair.

b. Installation

NOTE Whenever the Hi-Fi is disconnected, insert the jumper wire in the Hi-Fi socket located in the Radio housing, as shown in Figure 8, or receiver will not operate.

When set is being installed, feed plug and wire through hole in case, and engage chassis into slides in case. Push set in about halfway, and install ground wire in chassis. Install retaining screws and wire retainer. Install vibrator and insert plug into socket in radio. After installation, alignment of chassis can be made through hole used to install vibrator.

12. REMOVAL OF TURNTABLE (CHASSIS REMOVED FROM CASE)

To remove turntable, remove spindle retainer clip. Lift turntable and spindle from base plate. Check nylon wheels; wheels must spin freely. Inspect turntable top pad and make sure pad is properly cemented. The table and pad must be flat to provide good audio quality. Check turntable drive ring for proper cementing on under side of turntable.

13. REMOVAL OF IDLER ASSEMBLY (CHASSIS REMOVED FROM CASE)

Remove coupling shaft and bearing block. Remove four crosshead screws, and idler assembly. Use care when removing assembly because nicks or depressions in rubber wheel will result in poor audio quality (Flutter).

14. REPLACEMENT OF MOTOR (CHASSIS REMOVED FROM CASE)

Remove screws retaining cover to motor support. Unsolder black, red and white wires from terminals. Remove both screws which retain motor frame to bracket. Remove motor assemby and coupling will drop out. Install coupling on motor; install motor and resolder wires. Do not burn separators when soldering wires to terminals.

15. REMOVAL AND INSTALLATION OF COUPLING (CHASSIS REMOVED FROM CASE)

Two types of couplings are used, pin type with brass coupling shaft, and star type with nylon coupling shaft. The motor, coupling shaft, and bearing block with pin type coupling is not interchangeable with star type, unless all three components are replaced as a unit.

To remove coupling, pull carefully outward on motor and coupling will fall out. To install coupling, pull motor outward, engage coupling, and engage bearing block. There is sufficient movement in rubber mounts to install coupling.

16. REMOVAL OF TONE ARM (CHASSIS IN CASE)

If unit is equipped with a limit arm, remove the arm. To remove tone arm, press down gently on red tab and rotate arm until it is stopped by positioning latch. Allow stylus to fall momentarily; gently press down on red tab, swing arm to outboard position, and lift straight up. Do not lift arm up to high because this action may break connecting wires. A special lubricant is used on tone arm pivot and ball bearing. In addition to acting as a lubricant the material damps the lateral movement of tone arm. It is absolutely essential this lubricant not be wiped off and under no circumstances should a substitute be employed other than specified lubricant. If new tone arm is installed use specified lubricant.

17. REMOVAL OF ROCKER ARM (CHASSIS IN CASE)

Remove wire retaining clip by prying carefully with small screwdriver. If arm is to be replaced, it will be necessary to unsolder lead wires from underside of base. Press tab toward arm side until pivot pin is out of nylon bearing. (It may be necessary to lift retaining spring slightly, on opposite side of tone arm, to release rocker arm.) When assembly is re-

moved, the tension spring under rocker arm will snap back toward rear of rocker arm.

Make sure this spring is held in forward position, when rocker arm is installed in tone arm. Use care to prevent distortion spring. If spring is distorted, contact pressure of stylus will be changed. When rocker arm is installed, position lead wires. The arm should not contact the wire. The rocker arm must pivot freely in its nylon bearings.

Replacement of Needle

Pull needle from needle holder. When installing needle, make sure it snaps into slot on holder.

SERVICE DIAGNOSIS

18. TURNTABLE DOES NOT TURN

Check to see that motor is turning by observing flywheel. If motor is turning, check coupling between motor and bearing block. This may have been disconnected at either end, or it may have dropped off completely. If coupling is in proper position, check to see that damping spring is not too tightly set against idler lift arm, preventing it from dropping to its normal operating position.

19. MOTOR IS NOT TURNING

Make sure "Radio-Phono" switch is in "Phono" position and pilot lamp is lit. If pilot lamp is not lit and motor and vibrator are inoperative, check plug to see that it's secure in radio receptacle and check radio fuse.

With tone arm in "Off" and locked position, turn operating switch to radio position and spin flywheel with finger. The flywheel should spin freely. If flywheel spins freely, turn operating switch to "Phono" position, and check vibrator to make sure it is operating. If no vibration is felt vibrator should be replaced. Remove motor shield and check for open or shorted windings, or for wires shorting to chassis.

20. MOTOR DOES NOT SPIN FREELY

Check coupling to see that it is properly seated on both shafts. If coupling is properly seated, tightness may be caused by shift in position of self-aligning bearing used for motor shaft. Place screw driver on center of flywheel. With handle of another screw driver, gently tap handles together. (Care must be exercised to avoid hitting flywheel too hard or damage to motor may result.) When properly done, this should relieve misalignment of bearings. If flywheel is still tight, motor should be replaced.

21. TURNTABLE TURNS SLOWLY

Try another vibrator. Check for tight motor bearings, as outlined in Paragraph 17. Check battery voltage.

22. MOTOR VIBRATES WHEN UNIT IS ON

Make sure coupling is properly seated on both shafts, and that three rubber motor mounts are properly seated in motor support bracket and main casting.

23. ARM POSITIONS IMPROPERLY ON RECORD

If arm positions improperly when red tab is depressed and arm moved to "Stop", adjust tone arm's top assembly (in direction necessary) by loosening cross-headed screw located in slotted hole on top of assembly, moving entire assembly, then, tighten screw.

24. STOP LATCH OUT OF ADJUSTMENT

If tone arm is not positively stopped when red tab is depressed and arm moved to "Stop", lower stop latch by turning Allenhead screw (facing left on stop latch) counter-clockwise. Tighten nut on screw. If arm will not start records because stop latch is hooked over rocker arm, raise stop latch to clear arm. (Do not raise stop latch so high that positive stopping is not achieved). To raise stop latch, loosen nut on Allenscrew, turn screw clockwise as much as necessary, and tighten nut.

25. TONE ARM STUCK

If tone arm cannot be moved out of "Off" position by gently depressing red tab and gently pushing towards center of unit, check to see that tone arm shell is not hung up over idler lift crank. If it is hung up, tone arm can be released by gently lifting it until idler lift

crank can be moved to left, then arm should be pushed down.

Check to see that entire front of arm has not been pushed down by a severe blow. If this has happened, lift rear of arm about ¼ inch, press red tab, and move arm until it is no longer under housing. The arm may than be lifted completely off turntable for examination. If it is slightly bent, it may be possible to straighten arm with fingers, using care not to distort original shape of arm or damage needle. Make sure that rocker arm still pivots freely. If arm is badly bent, it should be replaced.

26. FLUTTER

This is a repeating sound (such as a thump or a gurgle), which occurs at frequency of about 40 cycles per second. Flutter can be caused by following conditions:

a. A bump or depression in idler wheel.

b. Motor flywheel rubbing.

c. Incorrectly aligned coupling.

d. Shock mount out of mounting hole.

e. Rough or non-concentric shaft in bearing block.

f. Rough nylon idler wheel (under turntable). The braided ground wire at right front of unit (going from underside of casting to front base rubber shock mount tray) may be rubbing against nylon idler wheel.

27. AUDIO DISTORTION

This is a slow repeating distortion (occurring every 1 or 2 seconds), which can be described as a change in pitch, such as that caused by warped record. Some causes of Audio Distortion may be:

a. Frozen or tight nylon idler wheels under turntable.

b. Slippery rubber drive ring under turntable (due to oil or grease on ring).

c. Bump or poor cementing of rubber drive ring.

d. Worn knurl on idler wheel. (This wheel drives rubber ring under turntable).

e. Tight or rough center spindle.

f. Poorly cemented rubber top on turntable (edge too high or loose).

g. Warped turntable or record.

28. STYLUS SKIPS OR JUMPS GROOVES WHEN CAR IS IN MOTION

a. Insufficient stylus pressure.

b. Defective stylus.

c. Unbalanced rocker arm.

d. Unbalanced tone arm.

e. Tone arm pivot improperly lubricated.

HOT WATER HEATER

The Chrysler MOPAR All Weather Comfort System supplies fresh air through cowl vent for ventilating, heating and defrosting (Fig. 12).

For summer operation there is one ventilator door provided, which directs fresh air from cowl vent opening to bottom of driver compartment. Two drain tubes are provided in bottom of air duct below ventilator door in case water does come in through vent.

For winter operation, turn blower on. The fresh air flows downward through heater case, heat exchanger blower, duct door and distributor duct. Temperature control is provided by a lever on instrument panel which opens the duct door on the right side of car to admit air to the distributor duct and also opens the heater water control valve. As the lever is moved toward warmer the water valve is opened further. The heater water valve will then maintain this temperature automatically.

Defrosting is provided by heated air flowing from distributor duct to defroster outlet on the top of instrument panel. The damper in the distributor duct divides the heater air to defroster outlet or floor as desired.

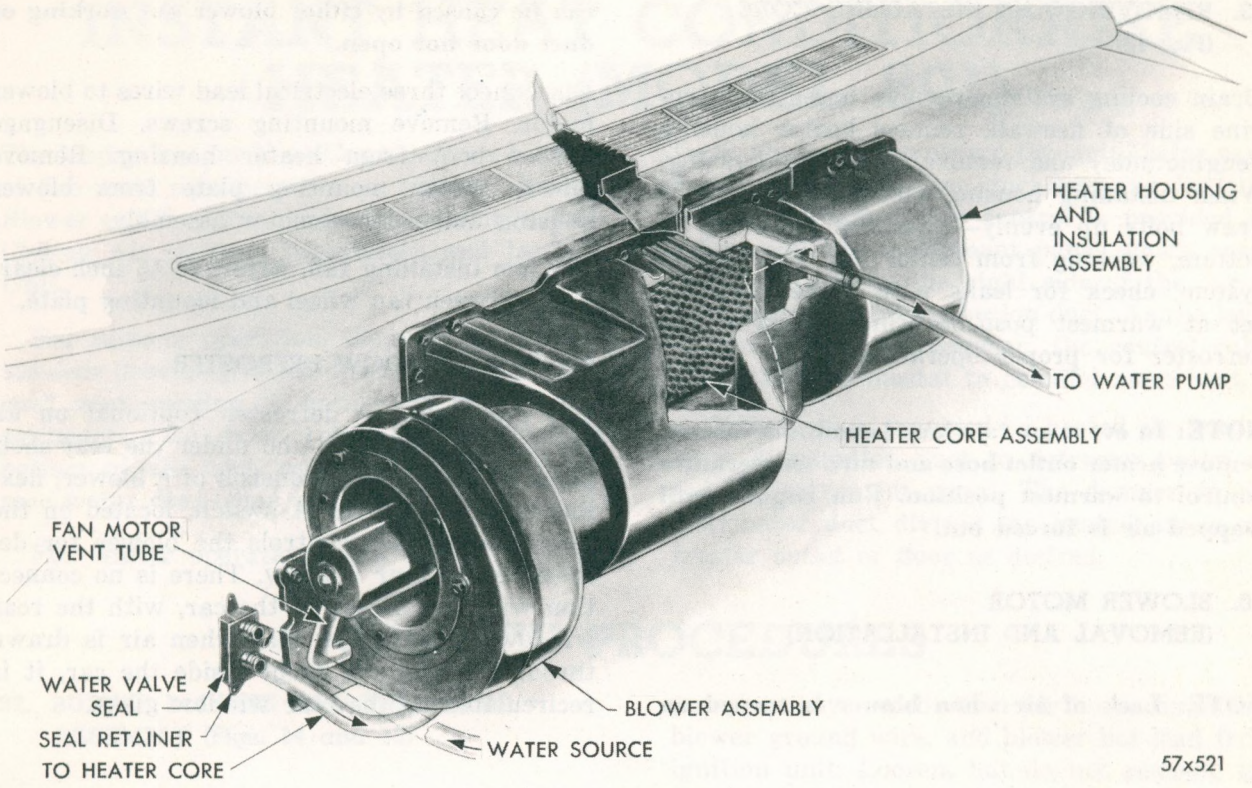

Fig. 12—Heater Installation (Engine Side)

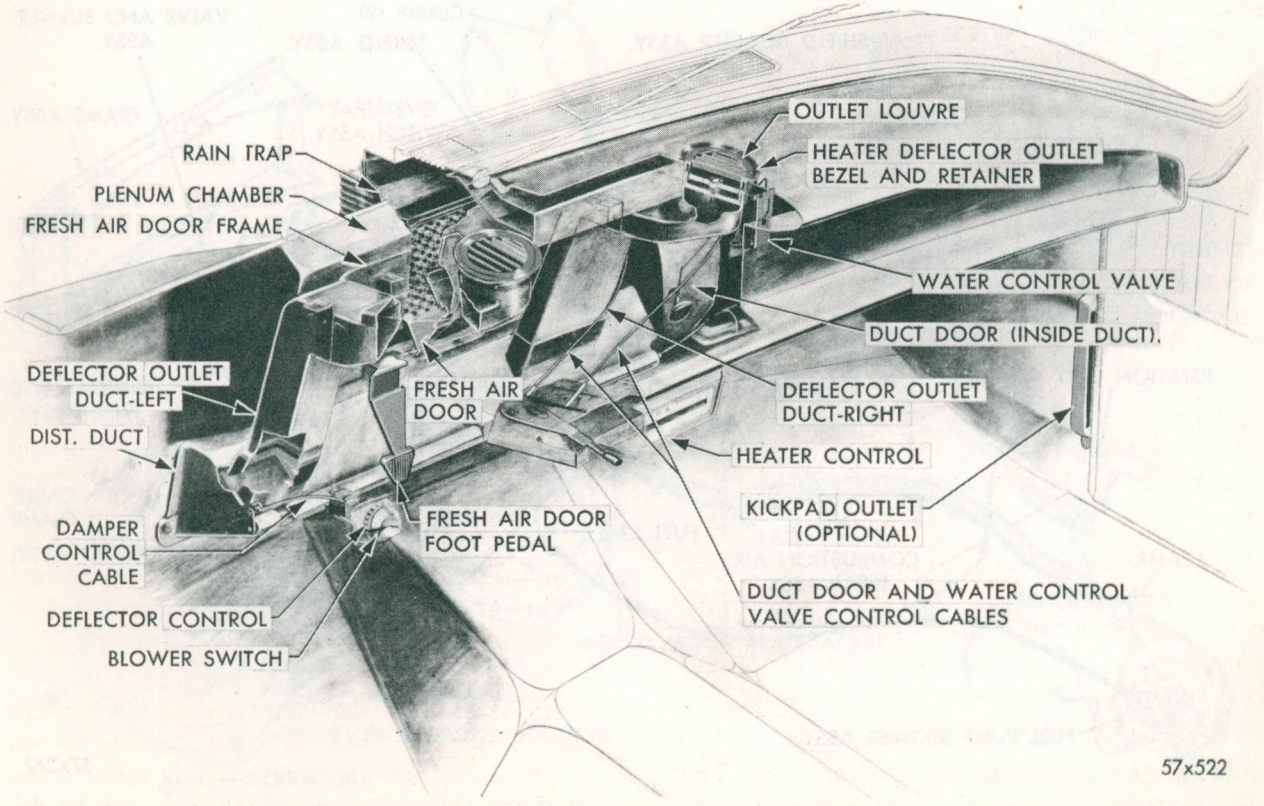

Fig. 13—Heater Installation (Driver's Side)

29. REMOVING AND INSTALLING CORE (Fig. 13)

Drain cooling system, remove hoses from engine side of firewall, remove heater housing (engine side) and remove core from housing. When installing housing and core be sure to draw bolts up evenly—alternate from top to bottom, working from center out. Fill cooling system, check for leaks with heater controls set at warmest position. Check blower and defroster for proper operation.

NOTE: In event an "air lock" condition occurs, remove heater outlet hose and turn temperature control to warmest position. Run engine until trapped air is forced out.

30. BLOWER MOTOR (REMOVAL AND INSTALLATION)

NOTE: Lack of air when blower is turned on can be caused by either blower not working or duct door not open.

Disconnect three electrical lead wires to blower motor. Remove mounting screws. Disengage rubber boot from heater housing. Remove blower motor mounting plate from blower housing and remove motor assembly.

When installing fan, adjust to ½ inch clearance between fan wheel and mounting plate.

31. REAR WINDOW DEFROSTER

The rear window defroster (optional on all Models) is located on and under the rear shelf panel of the car, and consists of a blower, flexible hose and nozzle. A switch, located on the instrument panel, controls the blower for defrosting the rear window. There is no connection with the heater in the car, with the rear window defroster, so that when air is drawn through the blower from inside the car, it is recirculated on the rear window glass.

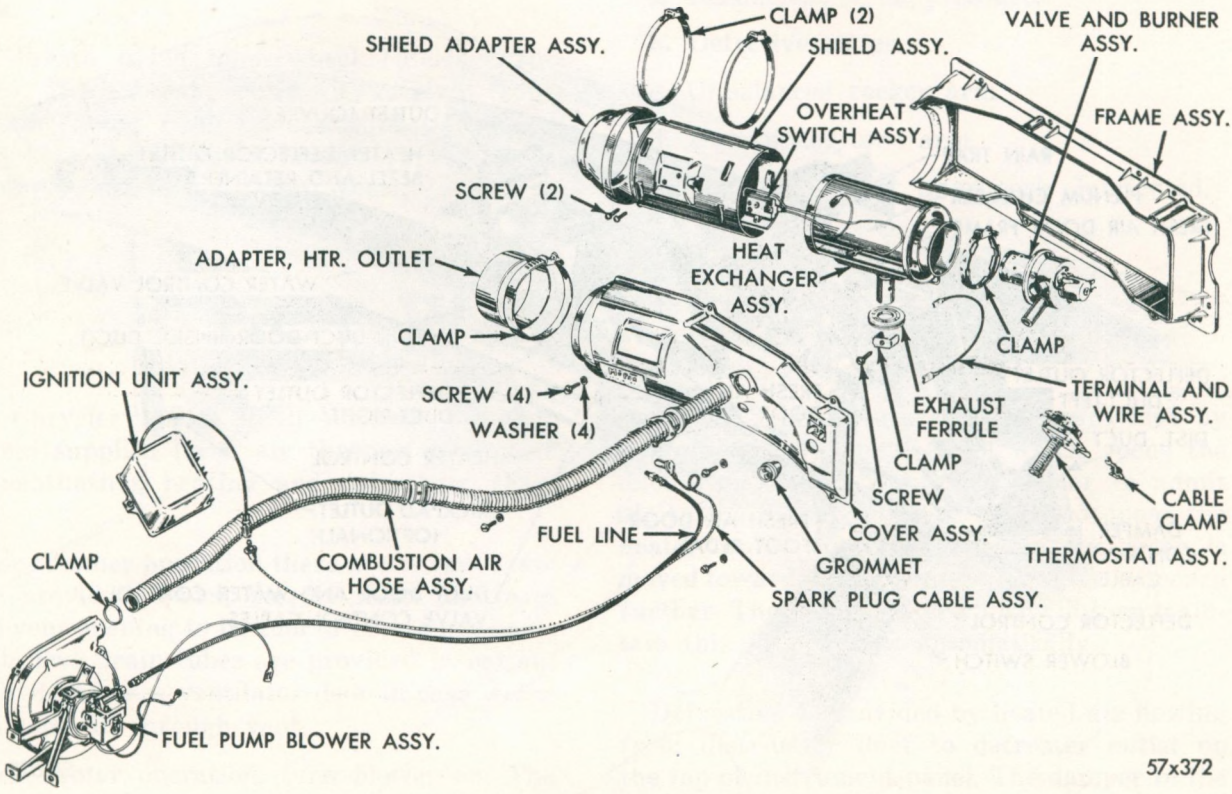

Fig. 14—Gas Heater Assembly (Disassembled View)

INSTANT HEAT CONDITIONAIRE HEATER (MODEL 801)

The Mopar Instant Heat Conditionaire consists of five main subassemblies as follows: Burner Blower and Fuel Pump, Heater Assembly, Ventilating Air Blower, Thermostat, and Ignition Unit.

For summer operation, there is one ventilator door provided, which directs fresh air from cowl vent opening to bottom of driver compartment. Two drain tubes are provided in bottom of air duct below ventilator door in case water does come in through vent.

For winter operation, turn blower on. The fresh air flows downward through heater case, heat exchanger, blower, duct door and distributor duct. Temperature control is provided by a lever on the instrument panel which opens the duct door on the right side of the car to admit air to the distribution duct. As the lever is moved towards warmer, the control cable moves the thermostat to demand more heat.

Defrosting is provided by heated air flowing from distribution duct to defroster outlet on top of instrument panel. The damper in the distributor duct divides the heated air to defroster outlet or floor as desired.

SERVICE PROCEDURES

32. BURNER BLOWER AND FUEL PUMP ASSEMBLY (Figs. 14 and 15)

a. Removal

Disconnect fuel line from both sides of fuel pump, remove combustion air hose, disconnect blower ground wire, and blower hot lead from ignition unit. Loosen, but do not remove, the screw in the mounting bracket clamp. The Fuel pump and Blower assembly can be removed by unhooking clamps from mounting bracket.

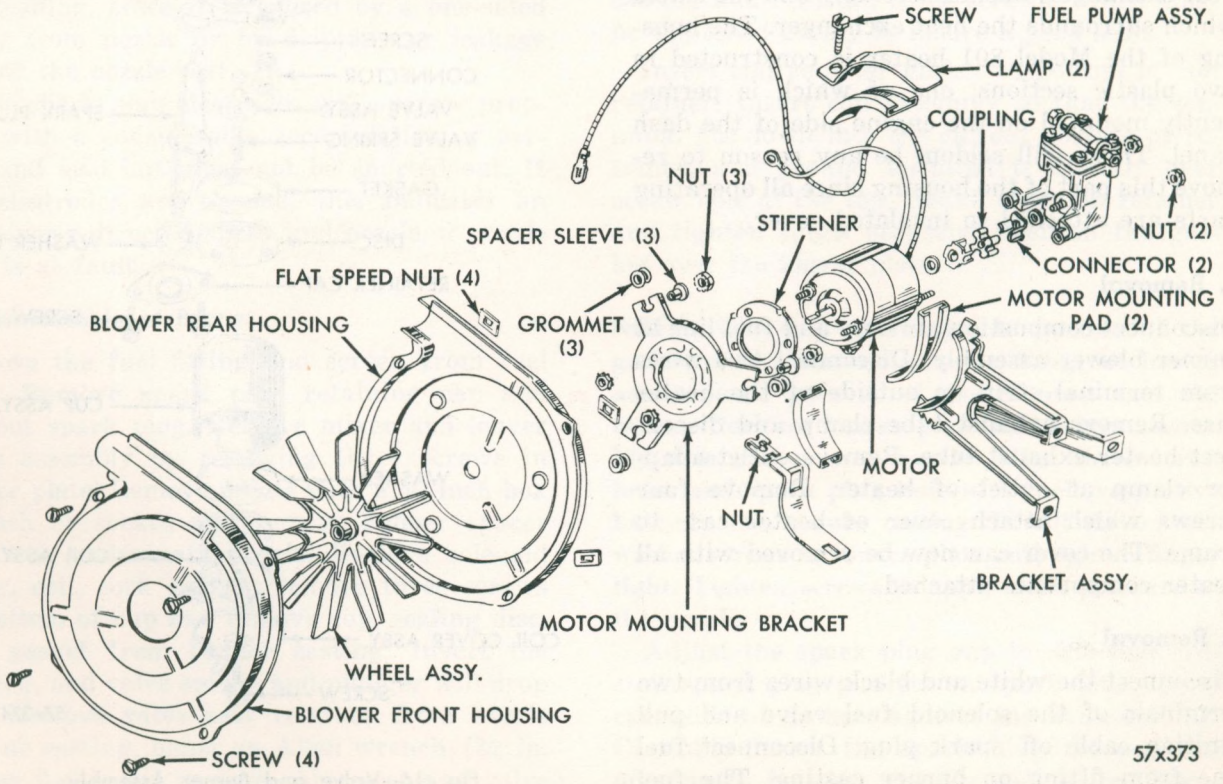

Fig. 15—Fuel Pump and Blower Assembly (Disassembled View)

Inspect fuel pump for evidence of leakage around pump cover. Tighten the screw securely if leakage is indicated. Inspect the rubber coupling between the fuel pump and motor and replace the coupling if it is worn or too soft.

b. Assembly

No attempt should be made to repair the fuel pump beyond tightening of the cover screws or replacement of damaged fuel fittings. If the pump is defective, replace the entire unit. When removing or replacing the coupling connectors on the fuel pump shaft and motor shaft, remember that both shafts have left-hand threads.

Check blower fan for clearance and freedom of movement. Repair or replace parts as required. When tightening nuts which attach the inner fan housing to motor mounting bracket, try the fan on the motor shaft and tighten nuts so that the rubber grommets will be compressed evenly but not too tightly. Excessive tightening will destroy the effectiveness of the grommets which are designed to reduce noise in the blower.

33. HEATER ASSEMBLY (Figs. 14 and 16)

The heater assembly consists of heater housing, heat exchanger, burner assembly and the shield which surrounds the heat exchanger. The housing of the Model 801 heater is constructed in two plastic sections, one of which is permanently mounted on the engine side of the dash panel. There will seldom be any reason to remove this part of the housing since all operating parts are attached to insulated cover.

a. Removal

Disconnect combustion air hose and fuel line at burner blower assembly. Disconnect two wires from terminal strip on outside of the heater case. Remove exhaust tube clamp and disconnect heater exhaust tube. Remove outlet adapter clamp at outlet of heater. Remove four screws which attach cover of heater case to frame. The cover can now be removed with all heater components attached.

b. Removal

Disconnect the white and black wires from two terminals of the solenoid fuel valve and pull ignition cable off spark plug. Disconnect fuel line from fitting on burner casting. The fuel line and ignition cable should not be removed

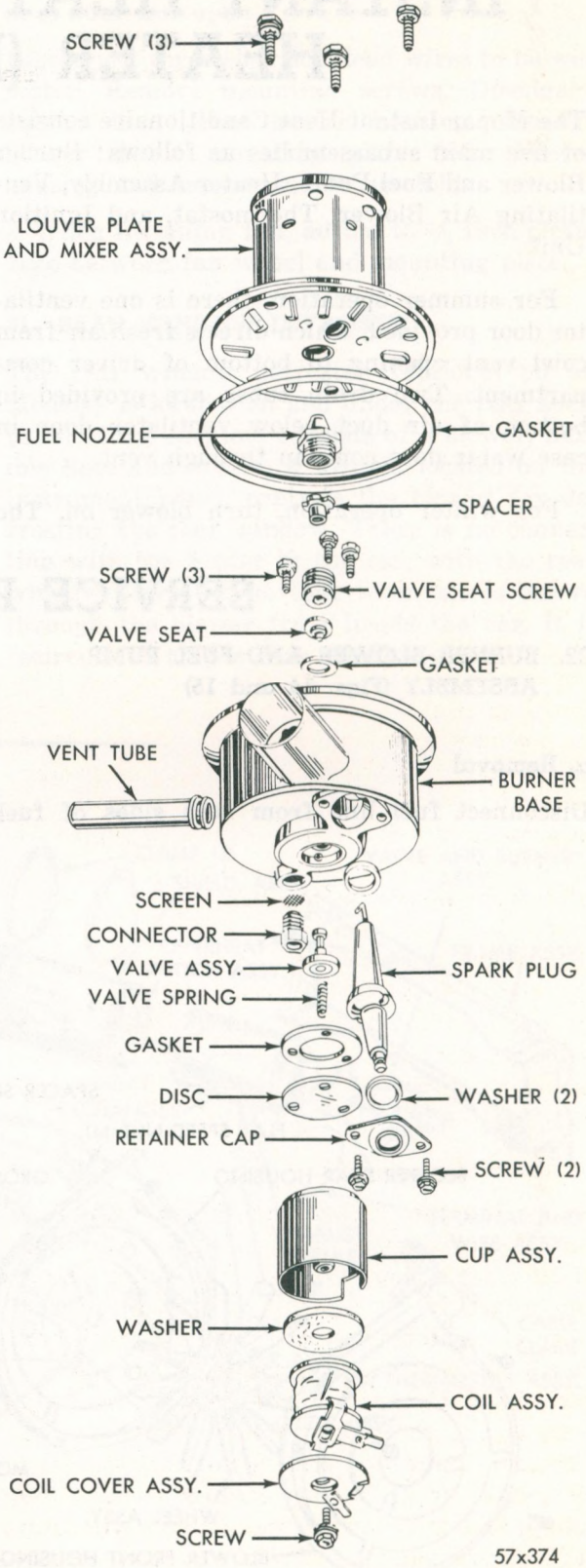

Fig. 16—Valve and Burner Assembly (Disassembled View)

from the grommet in the cover unless one or other requires replacement.

Loosen clamp which attaches the burner assembly to heat exchanger and break the seal formed by the gasket. The burner assembly can then be removed with rubber vent tube attached.

c. Inspection and Disassembly of Burner

The nozzle and mixer assembly should receive special inspection before disassembly since the condition of these parts will give an indication of the cause of unsatisfactory operation. The nozzle and inside of mixer can, around the nozzle, will normally be covered with a medium layer of black carbon and the nozzle should have a small gray opening at the orifice. The outer end of mixer will usually be burned to a gray or reddish color and some scaling or loose particles are usually present. These will do no harm.

Indications of improper operation are an uneven build-up of black carbon, or an excessively burned or eroded spot on the mixer. The openings around nozzle must not be clogged with carbon since this will prevent entry of proper amount of combustion air. If these symptoms are present, the condition will not be remedied by cleaning, since it is caused by a one-sided spray from nozzle or by dripping or leakage around the nozzle seat.

The spark plug electrodes will operate properly with a considerable accumulation of carbon and lead but must not be shorted out. If the electrodes are burned, this indicates an improperly directed spray and nozzle or nozzle seat is at fault.

d. Disassembly of Burner

Remove the fuel fitting and screen from fuel inlet. Remove spark plug retaining cap and lift out spark plug. Remove mixer and louver plate assembly by removing three screws in louver plate. Remove nozzle with a 5/8 inch box wrench or socket and remove rubber spacer which is underneath nozzle. Remove solenoid cover, coil, cork gasket; remove three screws in bottom of cup and remove cup, sealing disc, and gasket from burner casting. Invert the casting, and valve spring and plunger will drop out. Remove valve seat retainer from nozzle side of casting, using an Allen wrench (1/4 in. across flats) and remove valve seat and valve seat gasket.

e. Inspection of Burner

Inspect the valve seat for scoring around the sealing surface and inspect the end of plunger. The plunger contains a rubber insert which must be flat and slightly recessed into the metal retainer. If the insert is uneven, replace the plunger assembly. Do not attempt to clean or repair the nozzle. Replace this unit at each overhaul. Clean burner casting, mixer assembly and spark plug, being very careful not to permit any foreign matter to enter the passages of the burner casting. Discard any defective parts and replace with new.

f. Assembly of Burner

If fuel line inlet screen was removed from burner casting, install a new screen. Install the fuel inlet fitting and tighten. Install the valve seat gasket, the valve seat and the valve seat retainer in the order named, making sure the pointed side of the valve seat is toward the solenoid end of the casting. Tighten the retainer firmly but do not use force. Install a new spacer and nozzle and tighten. Insert the valve plunger in the other end of casting and check it for free movement, then place spring, gasket, sealing disc and solenoid cup on the casting and reinstall three screws, which must be tightened evenly to insure a good seal.

Insert coil retainer gasket in bottom of coil retainer. Insert coil assembly so that the terminal fits down into the cut-out portion of retainer, and ground terminal is directly over screw hole at the top. Install cover on retainer and tighten screw securely. Position the gasket over the louver plate.

NOTE: The step on the inside portion of the gasket must contact the outer flange of louver and tapered portion of gasket must face the mixer. Position louver plate and mixer assembly with gasket over nozzle. Align three screw holes and spark plug hole with their respective holes in the burner casting. Install three lockwasher screws in louver plate and tighten finger tight. Tighten screws to apply even pressure to the nozzle.

Adjust the spark plug gap to .085 inch. Install spark plug gaskets on spark plug, (concave side of gaskets against the ball portion). Carefully insert the spark plug through the opening in housing and through louver plate. Make certain that the guide slot of spark plug

is in line with guide on casting. Tighten spark plug cap attaching screws evenly and securely. Fit the rubber vent tube into the opening in the burner casting.

34. HEAT EXCHANGER AND OVERHEAT SWITCH (Fig. 14)

Do not remove the heat exchanger unless it is defective and needs to be replaced or the overheat switch requires service. The heat exchanger has no operating parts and should only require replacement after prolonged use. If replacement should become necessary, it can be removed as follows: Loosen two clamps inside cover of heater housing and work the exhaust ferrule free. Be careful not to bend the mounting brackets in cover when removing the heat exchanger and shield assembly. Spread the shield assembly by hand and let the heat exchanger slide out the straight end. The overheat switch will then be accessible and can be removed from inside the shield if necessary.

Inspect the heat exchanger for evidence of leakage, dents, loose seams and interior condition. The inside of the heat exchanger will normally contain a deposit of lead and other products of combustion but this should not be regarded as a defect unless the coating is sufficient to cause a noticeable increase in the warm-up period of the heater. When such is the case, the heater can be restored to its original efficiency by installing a new heat exchanger. It is not recommended that any attempt be made to weld or otherwise repair the heat exchanger. Clean as much of the deposits from inside the exchanger as possible and blow it out with compressed air. Replace entire unit if it appears unserviceable after cleaning.

Inspect overheat switch in heat exchanger shield for broken porcelain, burned or broken wiring, loose or broken contact points or other visible damage. Replace switch if such conditions exist.

35. THERMOSTAT (Fig. 14)

a. Removal

If the thermostat fails to control the duct outlet temperature, it is usually an indication that the cam is loose on the helix shaft or that end of helix has dropped out of slot in the control shaft. To correct this condition, adjust the thermostat as follows: Inspect the helix to make sure it is crimped tightly in the end of the control shaft. Fit the helix in slot and crimp shaft with pliers if necessary. Leave thermostat on bench until the helix reaches room temperature if it was removed from a cold car. Loosen allen set screw in plastic cam on the base end of control shaft, making sure the shaft is completely free to revolve and take its normal position at room temperature (about 75 to 85° F.).

With the plastic cam free on the shaft and the micro-switch down, move the control cable linkage as far as it will go to the left and hold in this position. While holding the linkage, turn the plastic cam in a counter-clockwise direction until the micro-switch just clicks, then tighten the set screws in the cam.

CAUTION

Do not disturb the two screws which attach the micro-switch to the thermostat base.

b. Installation

When reinstalling the thermostat, insert the

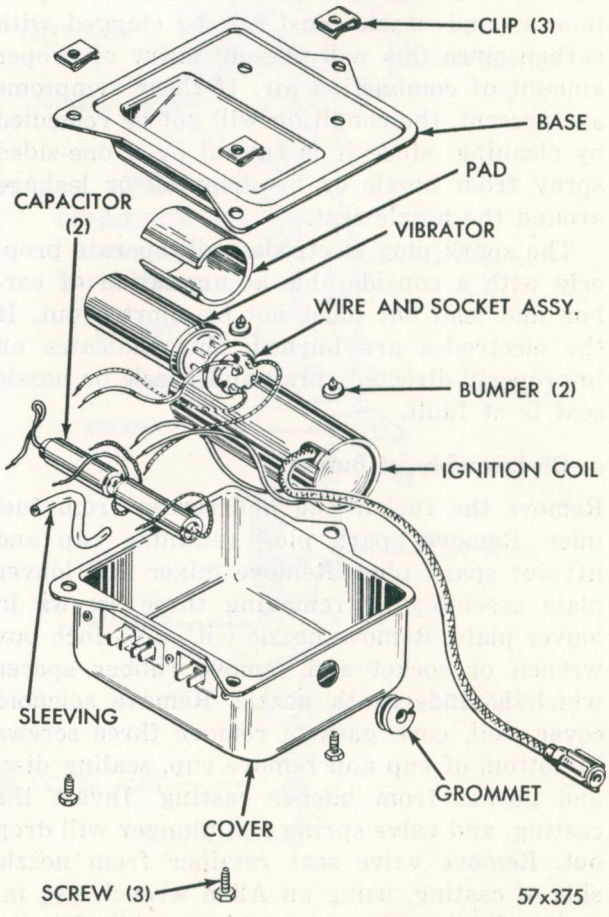

Fig. 17—Ignition Unit Assembly (Disassembled View)

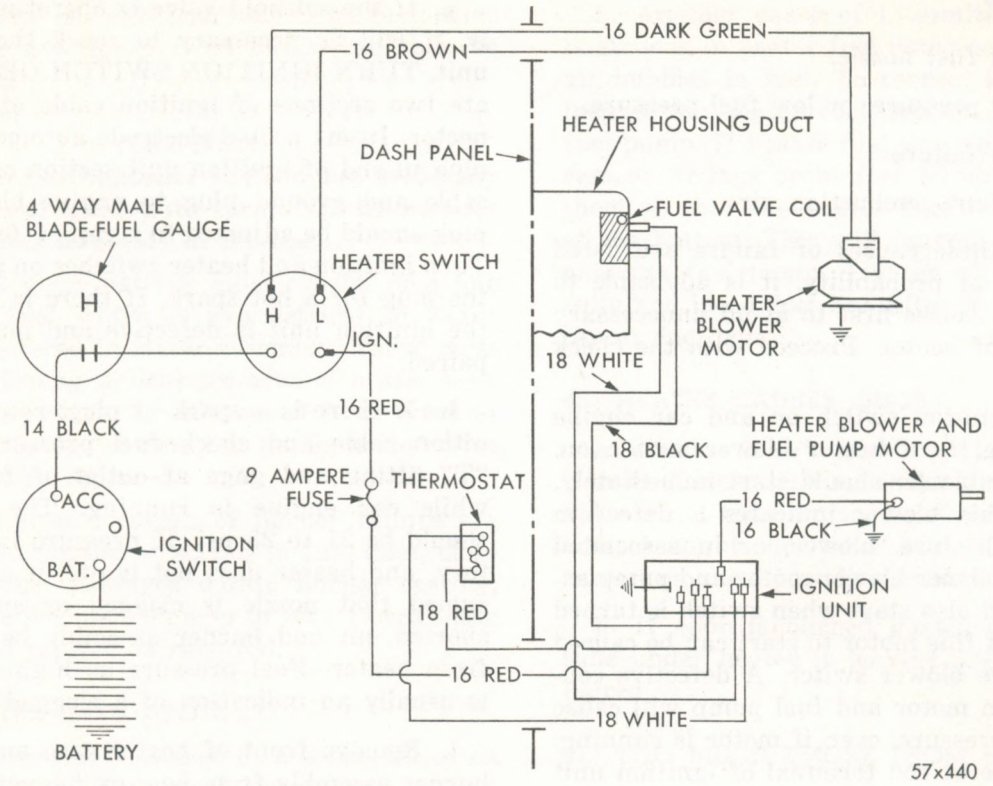

Fig. 18—Gas Heater Wiring Diagram

control cable and housing through the retainer clip located on the upper portion of the thermostat mounting plate. Insert end of cable through swivel hole of thermostat linkage, but do not tighten screw. Move temperature control to extreme low heat position; then move the thermostat control linkage in a downward direction as far as it will go. Tighten swivel screw. When thermostat cable is properly installed, the temperature control should move the thermostat linkage from one extreme to the other without interference from the cable housing.

36. IGNITION UNIT (Fig. 17)

The ignition unit is designed so that internal components can be replaced, thus reducing cost of service on this unit. In event of ignition failure that has been traced to ignition unit, it will be necessary to determine which component is responsible. This is most easily done by first substituting a vibrator that is known to be good.

If the trouble is eliminated, the old vibrator was at fault. If substitution of the vibrator fails to correct the difficulty, the ignition coil is probably at fault. Capacitor failure will usually lead to failure of the vibrator through pitting of the points and new capacitors should always be installed when the vibrator is changed. Failure of a capacitor may also be indicated by noise in car radio. To gain access to the ignition unit components, remove three mounting screws and remove the clips through which the screws were installed. The cover of the unit can be removed for servicing of components. Figure 18 shows the complete wiring diagram of the gas heater.

SERVICE DIAGNOSIS

The MOPAR Instant Heat Conditionaire is especially designed to simplify service procedures and requires no periodic service or inspection except a check at start of heating season to make sure that all wires are properly connected to ignition unit and heater case.

The burner blower and fuel pump assembly is lubricated at the factory for the life of the equipment and no attempt should be made to lubricate this unit in the field.

37. NO HEAT

a. Clogged fuel nozzle.

b. No fuel pressure, or low fuel pressure.

c. Ignition failure.

d. Insufficient combustion air.

Although these causes of failure are listed in the order of probability, it is advisable to check simple causes first to avoid unnecessary disassembly of heater. Proceed with the check as follows:

e. With ignition switch on and car engine NOT running, turn heater blower switch on. The fresh air blower should start immediately. Failure of this blower indicates a defect in blower switch, fuse, blower, or in associated wiring. The burner blower motor and pump assembly should also start when switch is turned on. Failure of this motor to start can be caused by a defective blower switch. A defective coupling between motor and fuel pump will cause loss of fuel pressure, even if motor is running. Check voltage at red terminal of ignition unit with a test light or voltmeter and if voltage is satisfactory, replace burner blower motor.

f. If both blowers run, check the fuel control valve by removing the white lead from terminal block on front of heater case. Touch this lead to terminal and listen carefully for a click as valve opens and closes. (The temperature control should be in HIGH HEAT position for this test). The click of valve is rather faint, but can be heard when engine is not running. If valve fails to click, shut off ignition, remove four screws from heater cover and lift it out far enough to install a jumper wire directly between white terminal inside case and white terminal of the solenoid valve. Disconnect overheat switch wires from these terminals but leave all other wires connected. Temporarily replace cover of heater case and turn on ignition. Touch white lead to terminal on front of case again and check for valve action. If valve fails to click with overheat switch shorted out, check voltage at white lead with a test light or meter. If lead is hot, and valve fails to click with overheat switch shorted out, the fuel valve solenoid coil is defective and must be replaced.

CAUTION

Do not permit the white lead to touch ground while making these tests.

g. If the solenoid valve is operating properly, it will be necessary to check the ignition unit. TURN IGNITION SWITCH OFF. Separate two sections of ignition cable at the connector. Insert a dual-electrode automotive type plug in end of ignition unit section of ignition cable and ground plug to engine block. This plug should be adjusted to a gap of .085 inches. Turn ignition and heater switches on and check the plug for a hot spark. If there is no spark, the ignition unit is defective and must be repaired.

h. If there is a spark at plug, reconnect ignition cable and check fuel pressure with a "T" fitting and gage at outlet of fuel pump while car engine is running. The pressure should be 21 to 23 psi. If pressure is satisfactory, and heater does not ignite, it can be assumed that nozzle is clogged or spark plug shorted out and burner assembly be removed from heater. Fuel pressure as high as 27 psi is usually an indication of a clogged nozzle.

i. Remove front of heater case and remove burner assembly from heat exchanger. Pull ignition cable and fuel line out of case and reconnect them to burner assembly. Leave solenoid wires disconnected. Ground this assembly to body of car and turn the heater switch on. Check for a spark at the spark plug electrodes.

CAUTION

Be sure burner is properly grounded and avoid touching any part of assembly during this test.

j. If hot spark appears at electrodes of spark plug, nozzle is defective and must be replaced. If spark is being shorted to ground or is completely absent, replace spark plug. If plug is shorted out by an accumulation of carbon, the nozzle is probably at fault and the spray pattern should be checked.

k. To examine the spray pattern, connect the white lead that was removed from front of case directly to insulated terminal of valve solenoid. Disconnect ignition cable from spark plug. Connect black lead to ground terminal in a similar way. At the ignition unit, disconnect both white wires and clip them together, using tape to insulate the connection. These wiring connections will energize the solenoid directly without going through the overheat switch (provided thermostat is calling for heat). After making connections, start engine and turn heater blower switch on (tempera-

ture control in high position). The fuel valve will open and spray from nozzle can then be examined.

CAUTION

Have a fire extinguisher at hand and avoid any possibility of igniting the spray. NEVER attempt to burn this assembly in the open.

l. The spray pattern must consist of a fine mist of fuel which is symmetrical in shape and is centered in mixer assembly. There must be no dripping or leakage around nozzle seat. If spray is coarse or uneven, or is directed at an angle in the mixer, the nozzle is defective and must be replaced.

m. Additional causes of burner failure are excessive clogging of screen in fuel inlet, clogging of fuel passages within burner casting, or a defective valve plunger or seat. Check these parts and replace as required.

38. HEATER GETS TOO HOT

This trouble can be caused by a poorly adjusted thermostat or insufficient fresh air. To test thermostat, connect a test light between white terminal of ignition unit and ground. Start heater with engine running. After heater warms up, the test light should go on and off as thermostat cycles the heater on and off. If the heater cycles, but test light remains on, it is an indication that thermostat contacts are remaining closed and heater is cycling on overheat switch. Install a new thermostat to correct this condition. The fresh air supply should be checked before replacing thermostat since proper thermostat action is dependent upon an adequate supply of fresh air through heater system. Insufficient air flow can be caused by defective fresh air blower motor or by an obstruction in fresh air system. Distributive ducts door must be open at any time heater is in use. Door is controlled by temperature lever on instrument panel.

39. HEATER WORKS INTERMITTENTLY

a. If heater gets very hot and shuts itself on and off in an intermittent way, the trouble is probably caused by insufficient fresh air flow. This will cause heater to shut off on the overheat switch. Check fresh air blower and short coupling duct between blower and heater, also distribution duct door where air enters duct on right side of passenger compartment.

b. Another cause of intermittent operation is air lock in heater fuel pump caused by small air bubbles in fuel. To correct this condition, inspect the heater fuel take-off tee in engine fuel pump. If heater fuel line comes off at top, remove fittings from fuel pump and reinstall them so that the heater fuel line is attached at the bottom. This will prevent bubbles from entering fuel pump. Tighten all fittings carefully and bleed fuel line after it is attached to heater fuel pump.

40. HEATER CAUSES ODOR

a. If odor is raw gasoline, the fuel connection at burner casting is leaking or solenoid valve is not tight on casting. Check and tighten leak. A slight odor when a new heater is first turned on should be disregarded.

b. If odor is burned gasoline, the exhaust tube under heater is leaking and must be repaired.

41. TOO MUCH SMOKE FROM HEATER

Excessive smoking and carbon are caused by a slow combustion air motor or a defective nozzle. Check these causes and repair or replace as required. This condition could also be caused by delayed ignition, resulting from spark plug electrodes which are badly burned, out of adjustment, or shorted with carbon. Check plug gap. It should be .085 inches and the electrode should be reasonably clean and approximately centered in insulator of spark plug. Bend the ground electrode when making adjustment.

42. HEATER MAKES NOISE WHEN STARTING

a. If heater "pops" or "spits" when starting or cycling, it is an indication that fuel is being admitted to burner that is not being instantly ignited. This can be caused by a leaking solenoid valve seat or plunger which will permit fuel to flow in the "off" position. Another possible cause is low fuel pressure from a defective pump, or a combination of low fuel pressure and insufficient combustion air caused by a slow burner blower motor.

b. Check fuel pressure first; if pressure is satisfactory, remove entire burner assembly from heater. Disconnect ignition cable and solenoid leads, but reconnect the fuel line. Examine inside of mixer can to make sure the

nozzle is dry. Turn the heater switch on to start burner blower and fuel pump which will apply fuel pressure to solenoid valve. Watch nozzle carefully for signs of leakage. The slightest amount of leakage through nozzle will indicate a defective shut-off valve which must be repaired as directed above.

c. This condition could also be caused by spark plug electrodes which are bent out of position, even though adjusted to proper gap. The center electrode of plug must be approximately straight to locate the spark gap in proper position with respect to the spray. Install a new plug and adjust by bending only the ground electrode to correct this condition.

43. HEATER FAILS TO START WHEN SWITCH IS TURNED ON. BURNER BLOWER DOES NOT RUN

a. Replace fuse.

b. Repair or replace red wire to center terminal of ignition unit.

c. Repair or replace red wire to blower. Check blower ground.

d. Replace motor.

e. Repair or replace switch.

44. BURNER BLOWER RUNS BUT HEATER FAILS TO IGNITE

a. Check thermostat and wiring and repair or replace as required.

b. Replace switch.

c. Repair as necessary ignition unit.

d. Replace plug and adjust gap.

e. Replace solenoid coil.

f. Replace nozzle.

g. Replace pump.

h. Repair or replace hose.

i. Replace coupling.

45. HEATER IGNITES BUT GOES OUT LATER

a. Replace or repair blower.

b. Open vent.

c. Remove obstruction.

d. Replace duct.

46. HEATER BURNS INTERMITTENTLY, HEAT OUTPUT IS TOO LOW

a. Replace thermostat.

b. Bleed fuel line and check all connections for leaks. Turn takeoff tee in engine fuel pump down if not already in this position.

47. HEATER BURNS INTERMITTENTLY, HEAT OUTPUT IS TOO GREAT

a. Check thermostat and repair or replace as required. Adjust control cable.

48. HEATER BURNS CONTINUOUSLY, HEAT OUTPUT IS TOO LOW

a. Replace nozzle.

b. Replace fuel pump.

49. ODOR OF RAW GASOLINE IN CAR

a. Tighten or replace fuel line and fitting.

50. ODOR OF BURNED GASOLINE IN CAR

a. Replace connection.

b. Replace or tighten clamp.

51. EXCESSIVE AMOUNT OF SMOKE FROM HEATER EXHAUST WHEN HEATER STARTS

a. Repair valve.

b. Repair or replace burner blower.

c. Clean exhaust, correct cause if clogged with carbon.

52. POPPING NOISE WHEN HEATER STARTS OR CYCLES

a. Repair valve.

b. Install new nozzle and tighten carefully.

c. Install new nozzle, check spray and adjust plug.

d. Adjust gap.

e. Check blower motor and hose. Repair or replace as required.

Section XVII

CHRYSLER HEATER-AIR CONDITIONING SYSTEM

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DATA AND SPECIFICATIONS

COMPRESSOR

	Airtemp
Location	Right Cylinder
Type	2 cyl.
Bore	2 5/16 inch
Stroke	1 1/8 inch
Displacement	9.45 inch
Type Valve	Reed Type
Speed (Depends on axle ratio and tire size)	Approx. 1250 r.p.m. at 25 m.p.h.
Oil Capacity (MOPAR Refrigerant Oil; 300 Saybolt)	12 ounces
Clutch	Rotating Coil
Muffler	In Compressor Discharge Line

CONDENSER

Location	Front of Radiator

RECEIVER STRAINER-DRIER

Type	Cylindrical Steel Container
Location	Front of Front Radiator Yoke

REFRIGERANT

Refrigerant	Freon 12 or Genetron 12
Total Charge	3 pounds

EVAPORATOR

Location	Cowl Panel

BLOWERS

Type	Centrifugal
Location	In Heater Unit
Capacity	250 to 300 cubic feet of air per minute at high speed
Current Draw	Approximately 10 amps

SPECIAL TOOLS

Tool Number	Tool Name
C-3354	TESTING OUTFIT—Consisting of one manifold complete with two valves; one 30 x 300 lbs. compound gauge; and one 600 lbs. pressure gauge. (Use with C-3365 and C-3366 Test Hoses.)
C-3355	GOGGLES—Safety (Pair).
C-3356	THERMOMETER SET—Two in separate pocket cases. (Calibrated from 0° to 220° F.)
C-3444	TORCH—Leak Detector—Includes extra tank of liquid petroleum fluid.
C-3358	WRENCH—Flare Nut—Open End Box Type 7/8" and 1 1/8" (two per set).
C-3361	WRENCH—Ratchet Special Refrigeration Type—1/4" sq. Drive with 3/16" sq. and 1/2" Hex. in Handle.
C-3372	PUMP—Refrigeration Vacuum (Pump charged with 75 Vis. Ref. Oil).
C-3128	PLIERS—Drive Pulley Seal Retainer Snap Ring.
C-3420	ADAPTOR—Freon Cylinder Valve to Test Hose.
C-3421	CLIP—Set of two—Attaching Thermometer to Tube.
C-3363	WRENCH SET—Flare Nut—Open End Box Type 3/4" and 1" Openings (two per set).
C-3365	HOSE—Test with End Plugs—4 Feet Long (set of two) (use with C-3354).
C-3366	HOSE—Test with End Plugs—8 Feet Long (use with C-3354).
C-3362	BENDER SET—For 1/4", 5/16", 3/8", 7/16", 1/2" and 5/8" Tubes.
C-804	TOOL—Tube Flaring.
C-3478	CUTTER—Tube.
C-3429	SCALE—Freon Weighing.
C-744	TEST LAMP.
C-3473	SEAT PULLER and installing tool.
SP-2922	COMPRESSOR CAPACITY TEST VENT CAP.

Section XVII
CHRYSLER HEATER-AIR CONDITIONING SYSTEM

A completely new combined Heater and Air conditioning unit (Fig. 1) has been developed for the 1957 Chrysler cars. The new unit is located in the dash area and provides temperature control for all-weather driving.

Temperature control in the 1957 Air Conditioner is secured through a reheating process. For summer operation, the air is dehumidified and cooled as it passes through the evaporator coil and then reheated by the heater core to a temperature that is selected by the driver. The amount of reheat added to the air as it passes through the heater core is controlled by metering hot water through the heater core. The flow of hot water is regulated by a modulating valve. A reheat type temperature control gives dehumidification even when minimum cooling is desired.

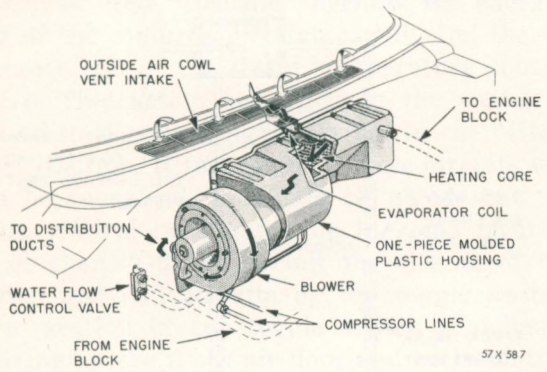


Fig. 1—Heater-Air Conditioning (Schematic Drawing Passenger Compartment Installation)

During the heating cycle, outside air is introduced into system through a permanently open vent in the top of cowl section (Fig. 2). Passing through the open fresh air door, air is drawn through both the cooling and heating coils by the Centrifugal Blower (Fig. 3). The air, heated by the heating coil, is then forced into the distribution duct for temperature distribution.

The cooling cycle is quite similar except that air may be brought from the outside or it may be recirculated through the recirculating door (Fig. 4). The controls are so arranged that the recirculation feature is only employed when maximum cooling capacity is required.

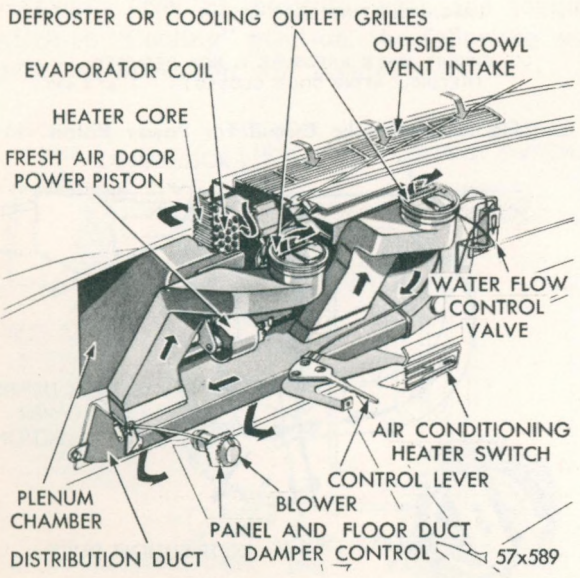


Fig. 2—Heater-Air Conditioning (Schematic Drawing Engine Compartment Installation)

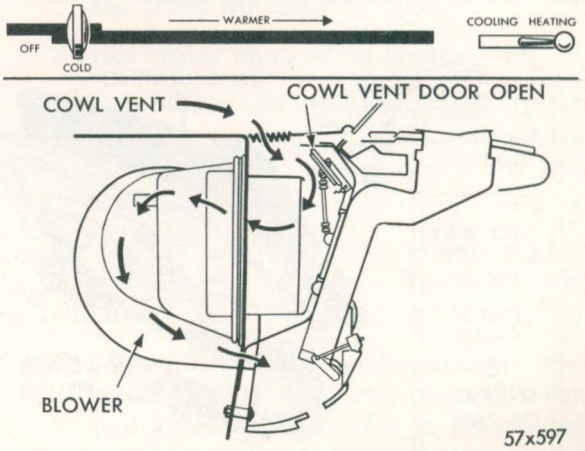


Fig. 3—Blower Motor and Vent Door (Schematic Drawing)

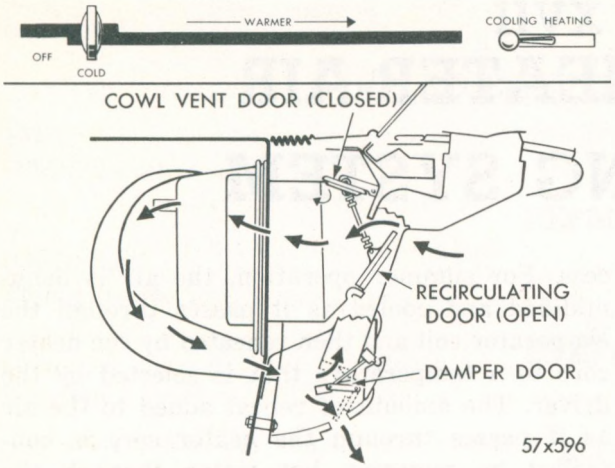


Fig. 4—Recirculating and Damper Door

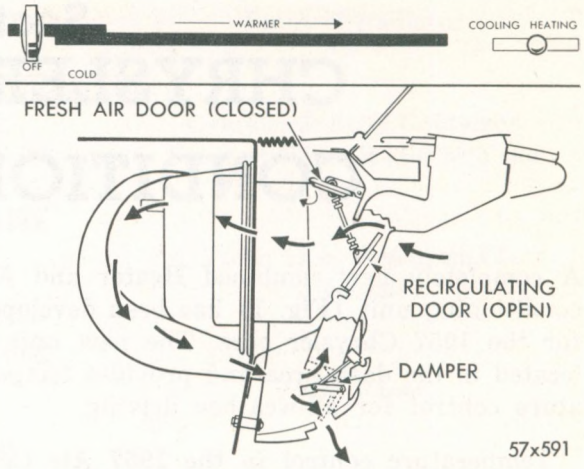


Fig. 6—Recirculating and Fresh Air Door

1. OPERATING CONTROLS

The controls for the heater-air conditioner are partially power actuated.

The main control lever, operating through a cable, operates the water temperature valve and also the fresh air and recirculating door through two electric switches, the solenoid valve, and power piston assembly (Fig. 5). When the solenoid valve is energized, it permits engine oil pressure to act on the power piston, closing the cowl vent fresh air door and opening the recirculating door. Figure 6 shows fresh air and recirculating doors. Figure 7 shows schematic diagram hydraulic circuit for operating the power piston.

Figure 8 illustrates the dampers used in controlling the system, and control components that are mounted on the instrument panel.

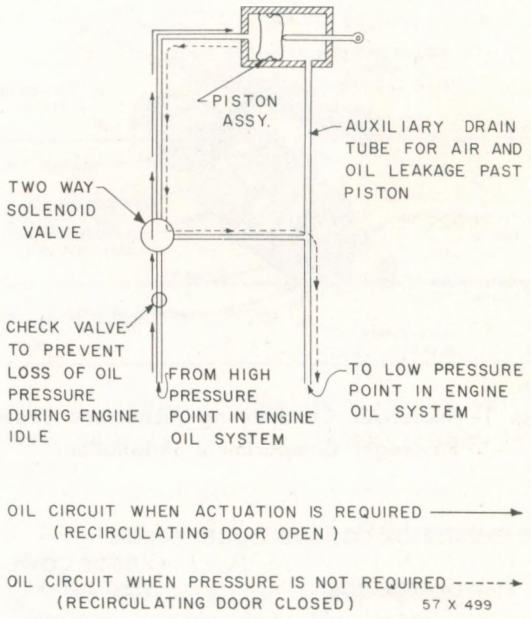


Fig. 7—Hydraulic Circuit for Power Piston

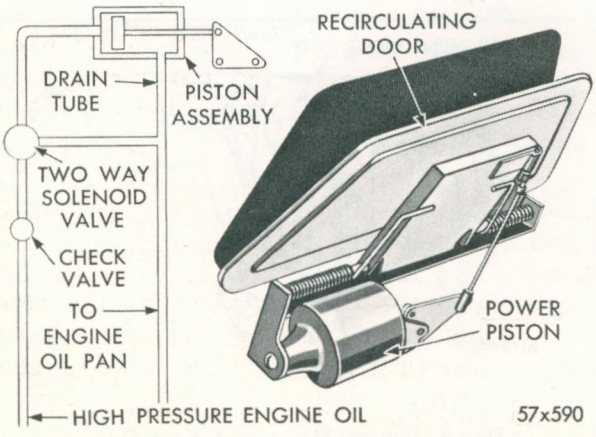


Fig. 5—Power Piston and Recirculating Door

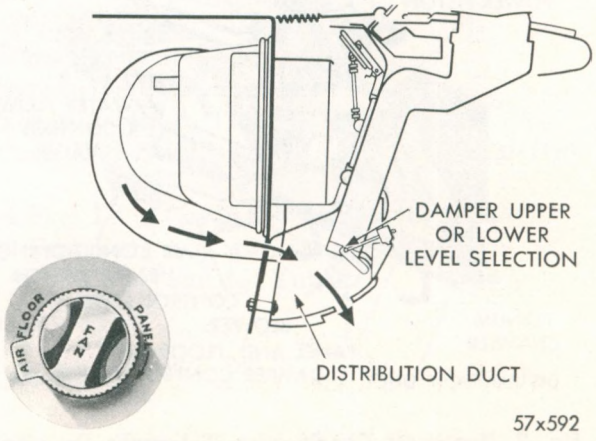


Fig. 8—Distributing Duct and Control Components

The fresh air door and the recirculating door are linked together in such a manner that when one is closed the other is open.

The two air flow control dials are mounted on concentric shafts. The inner "Blower" switch controls the speed of the blower motor. Three speeds are available through the selection of wire taps in the motor fields.

The outer dial marked "Air" controls the positioning of distribution duct damper, and is used to proportion the air distribution between the instrument panel grilles and the distributor duct slots. The control is lettered "Up" and "Down" with arrows indicating the proper rotation for panel or floor discharge.

The toggle switch with positions marked "Cooling" and "Heating" permits the energizing of the compressr clutch circuit and the resistance coil of the water temperature control valve. This action occurs when the switch is placed in the "Cooling" position. In the "Heating" position, it insures that these circuits will not be energized. It should be noted that the main control lever must be in some position other than "Off" to permit the closing of the clutch and coil circuits by the toggle switch. The position of the toggle switch also has a bearing on the fresh air door and recirculating door.

2. POSITIONING CONTROL LEVER

a. Moving the main control lever from "Off" to "Cold" (No. 2) position, with the toggle switch in "Cooling" position, the following sequence of operation will result:

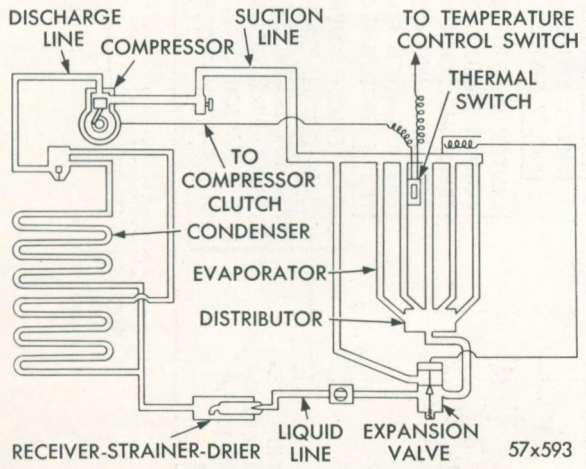


Fig. 9—Heater Air Conditioning (Schematic of Components)

1. Compressor clutch and water valve heating element will be energized (Figs. 9 and 10).
2. Hot water shut off to heater core.
3. Fresh air door closed and recirculating door open resulting in 80% recirculation air, 20% fresh air.
4. Maximum cooling will be obtained.

b. Moving the main control lever to the right from the "Cold" or No. 3 position with toggle switch on "Cooling" position, the following operational sequence will occur:

1. The fresh air door opens and recirculating door closes de-energizing the solenoid valve.
2. Full fresh air cooling obtained.
3. Lever mechanism picks up the cable controlling the water temperature control valve and prepares to open the valve.
4. Hot water shut off to heater core.

c. Moving the main control lever from No. 3 position through "Warmer" to No. 4 position opens the water temperature control valve. At the warmest point in the "Cooling" position, the water valve will allow the heater core to reheat the cooled air to approximately 75° F.

d. Moving the main control lever from "Off" to "Cold" or No. 2 position, (Fig. 6) with toggle switch in "Heating" position.

1. De-energizes the solenoid valve, allowing the recirculating door to close and the fresh air door to open.
2. Hot water shut off to heater core.
3. Total fresh air ventilation obtainable, proportioned as desired through instrument panel grilles and distributor duct slots.

e. As the main control lever is moved from the "Cold, No. 2 position to No. 3 position, with the toggle switch in "Heating" position:

1. Lever mechanism picks up the cable controlling the water temperature control valve and prepares to open valve.
2. Hot water shut off to heater core.
3. Total fresh air ventilation is obtainable.

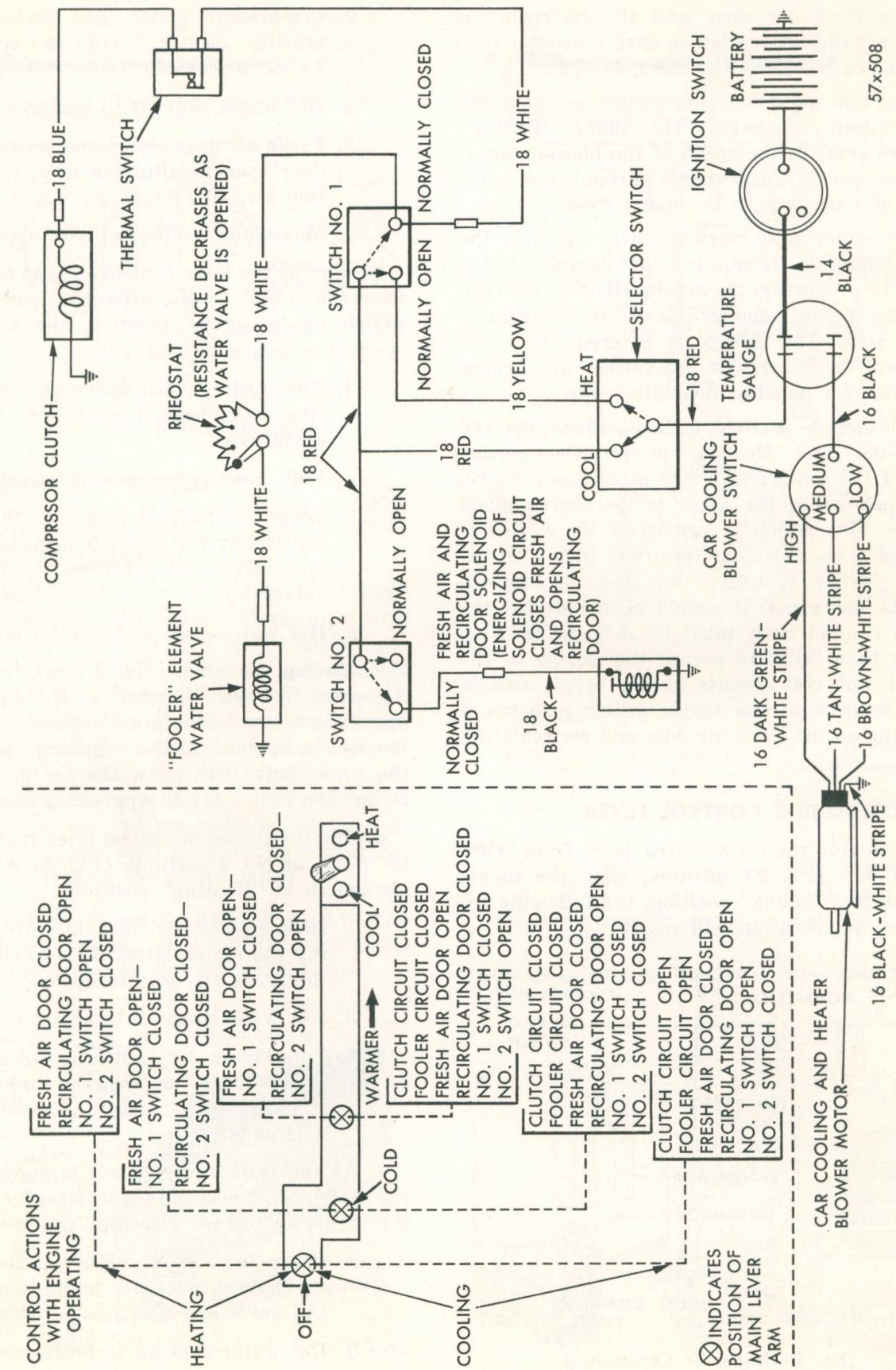


Fig. 10—Wiring Diagram (Heater-Air Conditioning)

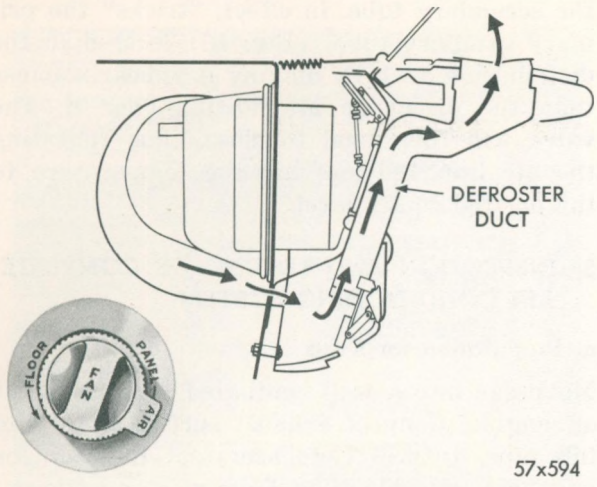


Fig. 11—Defroster Duct (Schematic Drawing)

f. Moving the main control lever from No. 3 position through "Warmer" to No. 4 position opens the water temperature control valve. At the warmest point in the "Heating" position, the water valve allows the temperature of the discharge air to reach approximately 130° F.

The fresh air door will always open and the recirculating door will always close when car engine is stopped. This puts the system in a "safe" position for car washing, parking during a rainstorm, etc.

3. AIR DISCHARGE AND DISTRIBUTION

Cooled or heated air can be distributed to either upper or lower level of car and it can be proportioned between the upper and lower level.

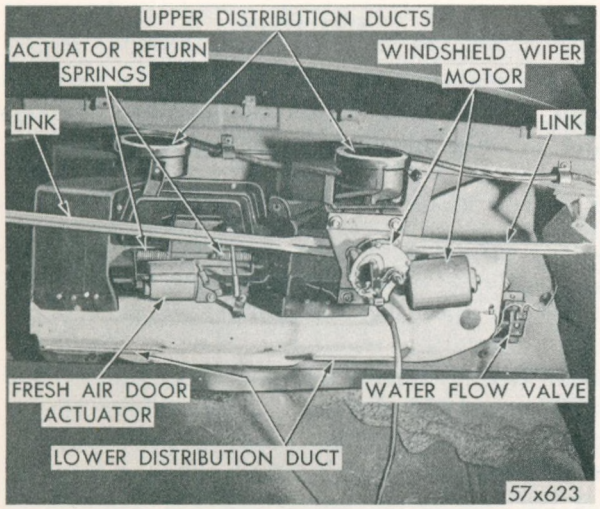


Fig. 12—Distributor Duct Installed

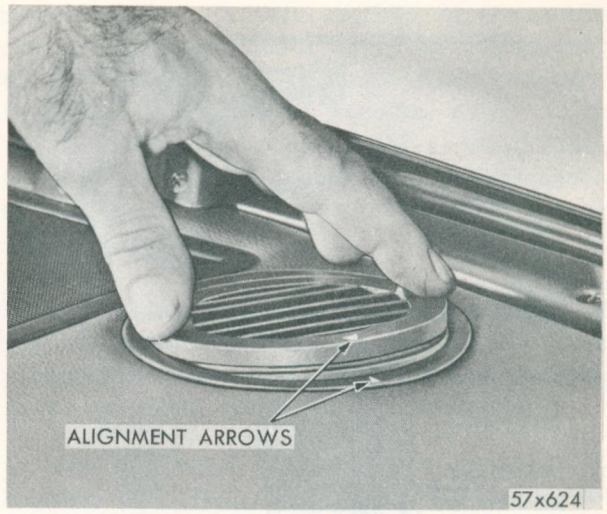


Fig. 13—Discharge Grille

Conditioned air is forced into the car by the blower that is mounted to dash. The air enters a distribution duct and can either be discharged toward the floor of car through slots in the distribution duct or it can be forced up to two discharge grilles in the top of instrument panel by means of a damper. In general, the air will be discharged to the lower level for heating and through upper grilles for defrosting (Figs. 11 and 12) and air conditioning.

The discharge grilles in the top of the instrument panel (Fig. 13) can be rotated through a full circle. The grilles, also have hinged deflectors which can be used to direct air up along the roof or directly at the occupants of the front seat.

4. TEMPERATURE CONTROL

For summer operation, the air will be dehumidified and cooled as it passes through the

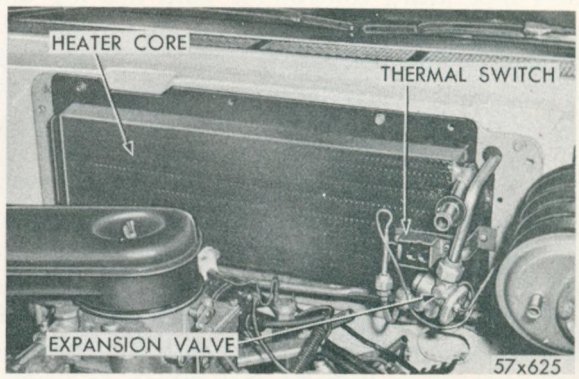


Fig. 14—Thermal Switch Installed

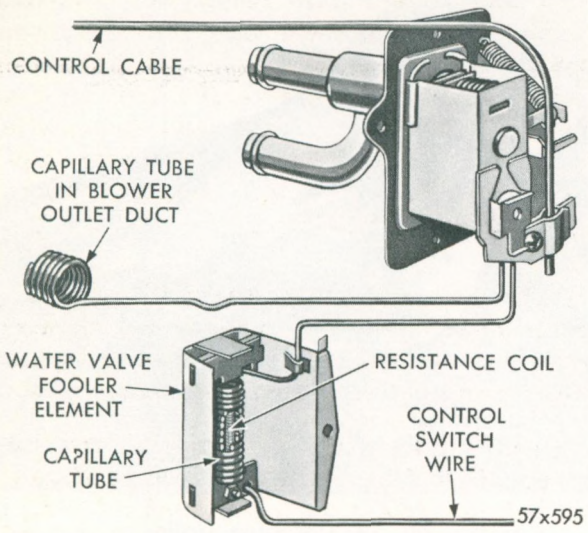


Fig. 15—Capillary Tube and Water Valve

evaporator coil and then reheated by the heater core to a temperature that is selected by the operator. The amount of reheat added to the air as it passes through the heater core is controlled by metering hot water through the heater core. The flow of hot water is regulated by a modulating valve. A reheat type temperature control gives dehumidification even when minimum cooling is desired.

A thermostatic switch is used to prevent evaporator coil from frosting over. The thermal switch is installed in the evaporator to sense the fin temperature of the coil. As temperature of evaporator fins decreases to a point where frost-over might occur, the thermal switch (Fig. 14) will break the compressor clutch circuit, stopping refrigeration until fin temperature increases to a point above the freezing point of water.

The same modulating water valve is used for temperature control for both heating and cooling. The temperature range of the valve is changed by an electric resistance heating coil when cooling is selected by operator. The valve is designed to control the discharge air temperature. For the heating cycle this temperature range will be from about 75 to 130° F. The discharge range for the Air Conditioning or summer operation will be approximately 40 to 75° F. This shift in temperature range is accomplished by the heating of the valve's temperature sensitive secondary capillary tube with resistance heating coil which is wound around the secondary capillary tube. Heating the secondary tube, in effect, "tricks" the primary capillary tube, (Fig. 15) located in the distribution duct, by making it appear warmer than the discharge air flowing over it. The valve will then tend to close, thus reheating the air less and shifting the temperature to the desired cooler level.

5. INSPECTION AND TESTING OF COMPLETE AIR CONDITIONING SYSTEM

a. Preparation for Tests

Move car into a well ventilated area and shut off engine. Connect exhaust suction system to tail pipe. Inspect condenser and radiator for bugs, etc., and blow out from side opposite entrance with compressed air.

b. Radiator

Check radiator pressure cap. A 14 pound pressure cap and a 180° F. thermostat is used in all models. Check cooling system and add water or anti-freeze to maintain proper level. The cooling system should be protected to a temperature of 20° above zero for summer (lower for winter).

c. Compressor Belt

Check compressor belt tension with a 5 pound pull scale in center of longest belt span. Compressor belt deflection (each belt) should be 5/16 inch deflection for new belt and 3/8 inch for used belts.

NOTE: A belt having a minimum of ½ hour engine run is considered a used belt.

CAUTION

Always replace both belts. Never run a new belt with an old belt. Check compressor brackets and bracket attaching bolts for being tight.

d. Blower Motor

Check for loose or poor electrical connections. Check blower switch. Make a blower circulation check by operating the blower on each of its three operating positions: "Low", "Medium" and "High". Check for change in operational speeds, and circulation.

e. Drains

Check plenum chamber and air conditioner housing drains (Fig. 16) for being clear.

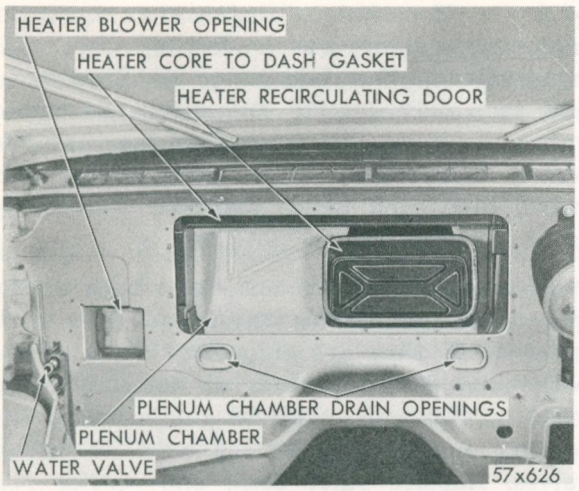


Fig. 16—Plenum Chamber and Drain Openings

6. COMPRESSOR CAPACITY TEST

To make a compressor capacity test, the system must be isolated from the compressor. In isolating the compressor from the system, a .020" test cap, Tool SP-2022 must be used to measure the amount of air pressure compressor delivers at given engine speed.

To make a compressor capacity test with a test cap, proceed as follows: Start engine, operate at 1200 r.p.m. Turn blower switch to "High" and temperature control lever to "Cold" position. Open car windows. Allow engine to operate until engine and compressor are up to normal operating temperature. Stop engine and remove the valve stem protective caps from suction and discharge valves. Use ratchet wrench, Tool C-3361 and back-seat both suction and discharge service valves by turning valves (counter-clockwise) all the way.

Remove service port caps from suction discharge service valve and attach hoses from gauge set manifold Tool C-3354 (Fig. 17). Attach hose from compound gauge on left of gauge assembly to the suction service port. Attach hose from right gauge to discharge service port. Close both right and left hand shut-off valves (clockwise) on gauge set manifold.

Start engine and with compressor operating, adjust engine speed to exactly 500 r.p.m. With ratchet wrench, Tool C-3361 rotate valve stem of suction service valve (clockwise) until valve is completely front seated. Front seating the valves will cause suction pressure to drop to zero, and from a zero reading to a vacuum reading "pumping down" all of the refrigerant out of compressor. With compound gauge reading 20 to 25 inches of vacuum, rotate valve stem of discharge service valve (clockwise) until valve is completely front-seated. Open right hand shut-off valve (counter-clockwise) on the gauge manifold set.

NOTE: This will allow the small amount of gas trapped between compressor and discharge valve to vent down to zero reading through gauge manifold set center connection hose.

Open left hand shut-off valve on manifold, remove hose from center connection of gauge set. Attach capacity test cap, Tool SP-2922, to center connection of gauge set manifold. Disconnect manifold hose from suction service valve leaving service port open.

CAUTION

Test cap must be absolutely clean before installation on gauge set connection. Wash with solvent and blow dry. Test cap is meter drilled and wire or similar instrument should never be used to open the vented orifice. If this is done a doubtful gauge reading may result.

Close left hand shut-off valve on manifold while noticing the pressure rise reading on high pressure gauge.

Operating engine at exactly 500 r.p.m. the pressure reading on high gauge should read 190 to 210 psi. To make sure reading on gauge is correct, open and close the left hand shut-off valve on gauge set several times. If pressure readings rise on gauge and correspond to specified specifications, the compressor is functioning up to specifications.

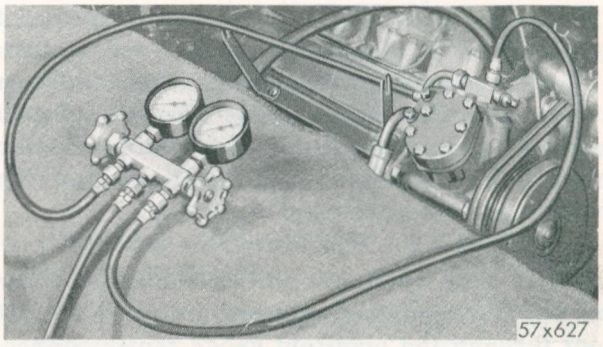


Fig. 17—Gauge Set Installed (Tool C-3354)

NOTE: If pressure reading is below specifications and tachometer and gauge is reading accurately, stop engine and check the compressor oil level since low oil level will cause a lower capacity test reading.

Add oil to compressor if necessary and recheck the compressor for capacity test readings. If compressor pressure is below the prescribed specifications with oil level at 2 inches at dip stick, the compressor valve plate assembly on both banks of compressor should be replaced.

After replacing valve plates on compressor, make a capacity test to again determine compressor pressure capacity. If compressor with oil level is corrected, and valve plates replaced, does not come up to specified pressure, remove suction service valve from compressor. Inspect suction screen (located in opening under valve) and see that it is clean, and gasket properly seated. If screen is clean, gasket not damaged, and compression test does not come up to specifications, the compressor should be replaced.

NOTE: When replacing compressor, an adjustment must be made to compensate for the oil remaining in system. Check and correct oil level in compressor to 2 inches (dipstick measurement). Start engine and run for approximately 15 minutes and check oil level again. Add or subtract to maintain specified limit.

Remove compressor test vent cap from manifold and wrap cap in clean cloth to protect orifice from dirt and grit. Open right hand shut-off valve on manifold gauge set. Close left hand shut-off valve. Connect suction hose to service port of suction service port.

With engine running at 500 r.p.m. and compressor engaged, "pump down" the compressor by bleeding the air out of compressor through manifold gauge center connection. When 25 to 28 reading is indicated on vacuum gauge, turn suction service valve a fraction of a turn (counter-clockwise) for a few seconds and then front seat the valve. This will allow small amount of gas accumulated in suction line to flow into compressor and crankcase, mixing with and to be absorbed by the oil.

NOTE: This operation will also cause the gas to flow through the compressor's cylinder and out through the manifold gauge center connection.

Probe the gauge center connection with tip of finger. If probing with finger at connection indicates no more gas is flowing, close right hand valve on manifold gauge set. Stop engine and turn both suction and discharge service valves (counter-clockwise) until they are completely back-seated. After back-seating each valve, turn each valve one turn (clockwise) to be in operating test position.

After completion of test, turn both suction and discharge service valves (counter-clockwise) until they are fully back-seated. Open both hand shut-off valves on manifold to release pressure on manifold gauge hoses. Disconnect and remove hoses from both service valves. Replace valve stem and service port caps and both service valves. Adjust fan belt. Check both cylinder head to compressor attaching bolts for tightness.

7. PRECAUTIONS TO OBSERVE IN HANDLING REFRIGERANT

WARNING

Safety Goggles, C-3355, should be worn to protect the eyes.

When properly used, refrigerant is harmless. A few simple precautions, however, should be observed to guard against injuries or sickness that might occur when refrigerant is improperly handled.

a. Precaution

Do not expose eyes to liquid. Do not rub eyes if splash of refrigerant hits them. Apply cold water immediately to area of eye to gradually raise the temperature above freezing point. The use of antiseptic oil is helpful since oil forms a protective film over eye ball until medical aid can be obtained.

b. Precaution

Do not discharge refrigerant in area where an open flame is present. The refrigerant normally is non-poisonous. A concentration of gas in a live flame, however, will produce a poisonous gas. Splashing refrigerant on bright metal or chrome should also be avoided because gas will tarnish bright metal.

c. Precaution

Do not leave charging tanks uncapped. Always

replace cap after using charging tanks. A charging tank is shipped equipped with a heavy, protective cap which is used to protect valve and safety plug from damage. To avoid moisture getting into system, charging tanks should not be opened to the atmosphere.

CAUTION

Use care to avoid moisture entering system. It is imperative when sweeping or charging the system that the refrigerant be passed through a Drier and Dry-Eye Assembly before the refrigerant enters the Air Conditioning System. See Figure 18 for methods of attaching "Dry-Eye" and "Drier" to tank assembly.

8. INSTALLING GAUGE SET MANIFOLD

Remove valve stem protective caps from compressor discharge and suction service valves. Using Tool C-3361, make sure both valves are completely back-seated (counter-clockwise). The normal operating position is when valve is rotated in a (counter-clockwise) direction. This position also isolates service valve ports from system pressure.

Remove protective caps from both discharge and suction service port caps. Install four-foot test hose from 600 pound gauge fitting on Tool C-3354 to discharge service valve port fitting. Install the other four-foot test hose from 300 pound compound gauge fitting on Tool C-3354 to suction service valve port fitting. Turn both valve handles of gauge set, Tool C-3354 (clockwise) as far as they will go. This will completely seat valves and isolate gauge set manifold center outlet from test hoses. To admit pressure gauges, rotate valve stems of both suction and discharge service valves one turn, (clock-wise).

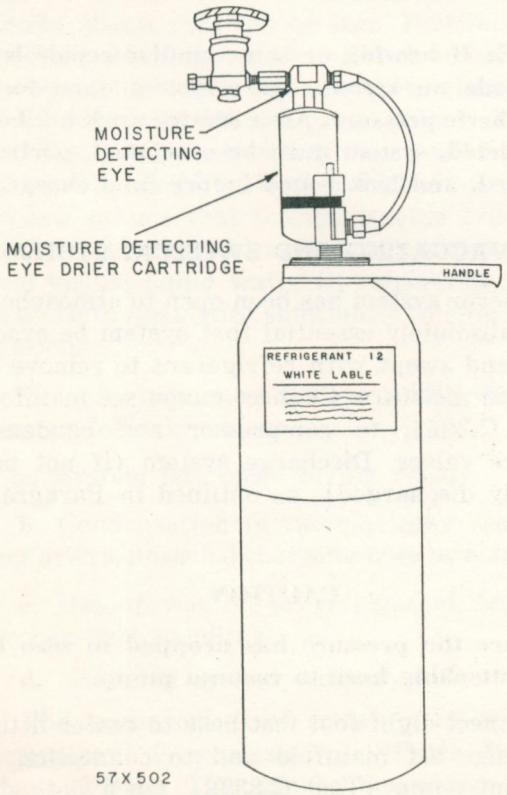


Fig. 18—Refrigerant Tank, Detecting Eye, Drier Cartridge (Schematic View)

9. TESTING FOR LEAKS WITH DETECTOR

When system is found to be low in refrigerant, or following repairs on system that necessitated opening of connection, it is necessary to test for leaks and tighten connections, or to make repairs as required before system is charged and put in operation. If system has been discharged for making repairs or to eliminate moisture, system must be evacuated before partially charging to test for a leak.

Partially charge system with refrigerant, as outlined in Paragraph 10, and proceed as follows: (This is necessary only where supply in system is very low, or when system has been evacuated).

The Tool C-3444 (Test Torch) uses petroleum gas and does not require generating to light. Just turn valve on, light it, and adjust to small flame. Move leak detector sniffer tube over all connections. When leak is found, flame in burner will turn bright green. Move detector tube around connection to determine magnitude of leak. If larger leak is found, color of flame will turn from bright green to bright purple.

NOTE: If leak is found at flared connection, try tightening connection, using two wrenches. If leak cannot be eliminated by tightening, system must be discharged, connection or flare reseated or replaced, system evacuated and again partially charged, and re-tested. If no leaks are found, add to partial charge until system contains three pounds.

10. CHECKING REFRIGERANT BY SIGHT GLASS METHOD

In some cases, it may be necessary to add refrigerant to system to provide cooling without weighing, as is normally required.

Follow preliminary steps, "Installing Gauge Set Manifold", Paragraph 8, and Charging System 16, but eliminate those steps involving scale. Start engine and operate at 1200 r.p.m. Turn blower control switch to "High" position and temperature switch to "Cold". Rotate both suction and discharge service valves one turn (clockwise). Where discharge gauge hand fluctuates when engine is running, close discharge valve slowly (counter-clockwise) until gauge hand steadies. Charge through drier. Refer to Figure 17 and install drier as indicated.

Open tank valve one turn. Open suction valve on gauge manifold slightly (counter-clockwise). Control refrigerant entering system with this valve. **Do not allow suction pressure to exceed 60 psi.**

Carefully watch sight glass, (Fig. 19). Close gauge manifold suction valve (clockwise) the moment sight glass is clear of bubbles. Stopping flow of refrigerant into system as soon as sight glass is clear (free of bubbles) is important. Too much refrigerant in system can cause damage.

Operate system for five minutes and again observe sight glass for presence of bubbles. If there is still evidence of bubbles, continue to carefully charge until sight glass is clear, and repeat five minute run. Where no bubbles are present after five minutes of operation, charge system with an additional charge of refrigerant for 10 seconds.

Close tank valve and loosen hose connection at tank to gradually release gas from hose. Disconnect hose after gas has escaped. Backseat suction and discharge service valves (counter-clockwise). Remove gauge manifold and install service valve stem and service port protective caps.

11. DISCHARGING THE SYSTEM

Install gauge set manifold Tool C-3354. Using Tool C-3361, be sure both discharge and suction service valves are fully backseated (counter-clockwise). Connect eight-foot test hose to gauge set manifold center fitting. Insert free end of eight-foot hose into exhaust suction system and turn exhaust blower on.

NOTE: Expelling the gas into the exhaust system is a recommended safety precaution.

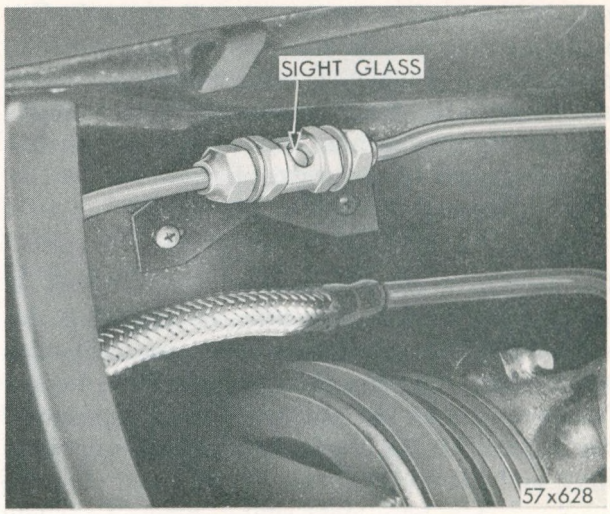


Fig. 19—Sight Glass Installed

Open discharge and suction service valves one turn. Crack manifold gauge set discharge hand valve a fraction of a turn (counter-clockwise) to allow gas to escape. Opening manifold discharge hand valve too much in order to more quickly discharge system will draw compressor lubricant off with the gas. As pressure on manifold discharge gauge drops near zero, open manifold suction hand valve.

NOTE: If brazing or some similar repair is to be made on system, leave system open to atmospheric pressure. After service work has been completed, system must be evacuated, partially charged, and leak tested before final charge.

12. EVACUATING AND SWEEPING SYSTEM

Whenever system has been open to atmosphere, it is absolutely essential that system be evacuated and swept with refrigerant to remove all air and moisture. Connect gauge set manifold, Tool C-3354, to compressor and condenser service valves. Discharge system (if not previously discharged), as outlined in Paragraph 11.

CAUTION

Be sure the pressure has dropped to zero before attaching hose to vacuum pump.

Connect eight-foot test hose to center fitting of gauge set manifold and to connection on vacuum pump (Tool C-3372). Open both discharge and suction service valves about one turn, rotating both valve stems (clockwise).

Open both gauge set manifold hand valves turn (counter-clockwise). Start vacuum pump and observe compound gauge. Operate pump until gauge registers 26 to 28 inches of vacuum. Continue evacuating at 26 to 28 inches for five minutes. Failure to obtain 26 to 28 inches of vacuum would indicate a leak in system. Close both gauge set manifold hand valves (clockwise). Turn off vacuum pump and remove long test hose from pump. Charge system with refrigerant gas, as outlined in Paragraph 16.

Start engine and adjust speed to 1200 r.p.m. Turn blower control to "High" and temperature control to "Cold". Operate in this manner for five minutes and test for leaks. Discharge system to sweep out any remaining moisture, and again evacuate system at 26 to 28 inches of vacuum for 10 minutes. Recharge system with three pounds of refrigerant.

13. MOISTURE IN AIR CONDITIONING SYSTEM

Moisture in automotive air conditioning systems is directly or indirectly the real cause of many failures in air conditioning systems. Basically, moisture can be classified as visible and invisible. Visible moisture, such as rain, clouds, steam, etc., can be seen. Invisible moisture is water vapor which cannot be seen with the eye. This water vapor is everywhere—it is in all solids, liquids and gases. It is in the air, and the varying amount is expressed in terms of relative humidity. Withdrawal of refrigerant from a system that is experiencing freeze-ups at the expansion valve, does not ordinarily reveal visible liquid water in refrigerant, yet it is there in quantities sufficiently to stop refrigeration.

Moisture may enter the air conditioning system in following manner:

a. System left open during repair.

b. Condensation in tubing, leaky seal caps, wet driers, unsealed charging hose or manifolds.

c. Use of wet oil or refrigerant from improper field handling.

d. Charging system without drier.

The measurement of moisture content in a refrigerant is expressed in "Parts Per Million" (PPM). This can be illustrated by saying that one drop of water, in one million drops of water is one part per million. It can also be further illustrated by stating that one drop of water raises the moisture content of 25 pounds of "Refrigerant 12" about 5 (PPM), or 1 pound of "R-12" about 125 (PPM).

In order to be certain the moisture content of a "Refrigerant 12" Air Conditioning is kept out of the freeze-up range, acid producing and corrosion range, the moisture content should not exceed 10 (PPM). The progressive result of moisture in excess of 10 (PPM) in "Refrigerant 12" is as follows:

Refrigerant 12 plus moisture equals freeze-ups at expansion valve.

Refrigerant 12 plus moisture equals acid (Hydrochloric & Hydrofluoric).

Acid plus metals and refrigerant oil equals corrosive sludge.

Corrosive sludge plus expansion valves equals sticky or stuck valves.

Corrosive sludge plus screens and strainers equal plugged screens and strainers.

Corrosive sludge plus compressor reed valves equals corroded leaky valves.

Refrigerants such as Refrigerant 12 are known as auto-driers. In a closed container, moisture tends to leave the liquid and concentrate in the vapor. A full tank of "Refrigerant 12" when received from manufacturer, is as "dry" of moisture as the manufacturer can produce it. Yet it will still contain from 6 to 10 (PPM) moisture in the liquid phase. At room temperature, "Refrigerant 12" in the vapor phase (refrigerant gas above the liquid in a tank) can hold as much as seven times amount of moisture as it does in liquid phase.

This means starting with a full tank of "Refrigerant 12" containing 6 to 10 (PPM) moisture in the liquid phase, the vapor above the liquid can contain 42 to 70 (PPM).

As this vapor leaves the tank and is charged into the Air Conditioning System, the moisture enters the system with the vapor. As more and more refrigerant vapor leaves the tank, more and more liquid refrigerant boils into a vapor and the vapor can extract a 7 to 1 ratio of moisture from the liquid remaining in the tank. By the time the full tank of "Refrigerant 12" is down to about half full, the remaining half tank of refrigerant liquid and vapor will be very dry, as all of the moisture originally con-

tained in the full tank of liquid has been extracted by vapor and charged into the Air Conditioning System.

CAUTION

Always insist on delivery of refrigerant in unopened tanks. Do not accept tanks refilled by anyone other than the manufacturer, because of the possibility of the tank containing free water.

For the above reasons it becomes imperative when charging a system, to pass the refrigerant vapor through an efficient drier before it enters the system. If this precaution is not taken, as much moisture may be induced back into the system as was removed during evacuation and sweeping.

See Figure 18 for method of attaching "Drier" and "Dry-Eye" to tank assembly. Refer to "Charging The System, Paragraph 16, for use of "Drier" and 'Dry-Eye" equipment to eliminate moisture from system.

NOTE: Drier cartridges are available in 8, 12, 20 and 30 cubic inches. A 12 cubic inch cartridge is recommended for use with refrigerant tank. On receival, make sure cartridge is sealed with white plastic seal cap. This cap is used to seal moisture from drier cartridge.

Used drier cartridges can be re-activated when saturated with moisture provided refrigerant containing oil has not flowed through the drier, by unsealing the cartridge and placing it in a heated oven for a given number of hours. For example, if the cartridge is placed in a 300 degree oven, it should remain there for 2 hours, 1½ hours in a 400 degree oven, or 1 hour in a 500 degree oven, etc. After heating, allow cartridge to cool, reseal with plastic cap and gasket, store in a dry area (at room temperature). To charge system refer to Paragraph 16.

14. CHECKING SYSTEM FOR MOISTURE

With tubing coil, sight glass, moisture detecting eye and cap made up into an assembly, as shown in Figure 20, remove valve stem caps from suction and discharge service valves, back-seat and fully open (counter-clockwise) both valves. Remove caps from valve service ports and attach tubing and flare fitting assembly to the valve service ports, as shown in Figure 20.

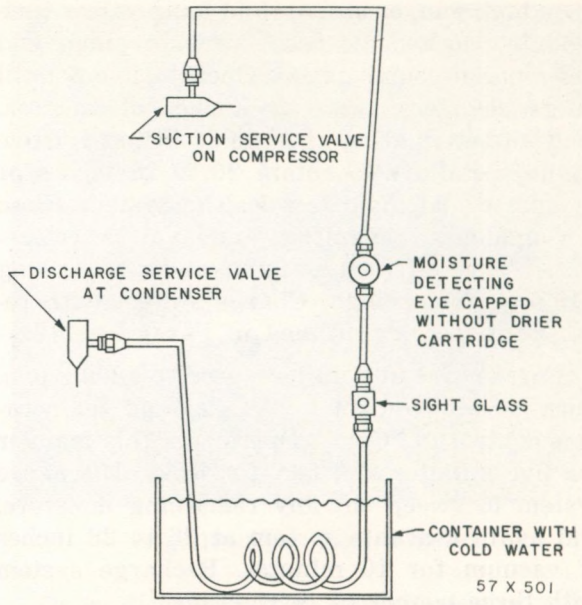


Fig. 20—Moisture Detecting Eye (Schematic Drawing)

Fill the container with cold water to allow for submersion of coil in water, as shown in Figure 20. Turn valve stem of discharge service valve two turns (clockwise). Purge air from tubing by slowly loosening up the tubing nut at suction service valve. After all the air has been bled from tubing, retighten nut. Test all connections for leaks. Start engine and adjust engine speed to 1200 r.p.m. Open car windows and move the operating lever to "Cold" position, and blower switch to "High".

Slowly turn the valve stem of the suction service valve (clockwise) two full turns, and check sight glass (Fig. 19), for flow of refrigerant liquid through glass. After approximately 15 to 20 minutes of engine operation with liquid flowing through the moisture detecting eye and if the dot of eye shows **pink**, excessive moisture is present in system.

If system is "dry" or contains a minimum of moisture, the dot of eye will slowly change to **light blue** indicating the system contains 10 to 20 (PPM) of moisture. When dry eye shows a **dark blue** the same color as corresponds to the dot on eye, it is indicative that system contains less than 10 (PPM) of moisture and is now ready for safe, satisfactory operation.

NOTE: If moisture detecting eye shows pink, excessive moisture is present. Light blue will indicate the system is border line, and moisture content should be lowered.

To remove the moisture detecting eye and tubing assembly, proceed as follows: With air conditioning system operating, back-seat first the discharge service valve, and then suction service valve (counter-clockwise) and stop engine. Remove tubing coil, sight glass, moisture detecting eye and cap assembly from suction and discharge service valves.

NOTE: Install protective flare plugs in end of tubing fitting to keep moisture and other foreign matter from entering tubing.

15. CORRECTING A WET AIR CONDITIONING SYSTEM (WITHOUT DISCHARGING SYSTEM)

With tubing and 30 cubic inch drier cartridge and detecting eye made up into an assembly, as shown in Figure 20, proceed as follows: Remove valve stem caps from suction and discharge service valves and fully back-seat (counter-clockwise) both valves. Remove caps from valve service ports. Remove flare plugs from tubing and drier cartridge assembly and attach flare nuts of tubing to service valves, as shown in Figure 20.

NOTE: Elevate drier and cartridge assembly above compressor height to facilitate absorption.

Turn valve stem of discharge service valve two turns clockwise, and slowly loosen tubing nut at suction service port. Purge air from tubing and drier. Retighten tubing nut after purging air. Test all connections for leaks and correct if needed. Turn valve stem of suction service valve two turns (clockwise).

NOTE: With the vehicle located in an area where the air conditioning system can maintain room temperature, allow vehicle to set for approximately 24 hours, or for sufficient time to allow the drier to absorb sufficient moisture.

When detecting eye has turned a **deep blue,** matching the comparison color dot on the dry eye unit, the system is now sufficiently dry to permit satisfactory air conditioning operation. The chemical action, involving a change from a moisture-laden refrigerant to non-moisture laden refrigerant, is as follows: The drier absorbs moisture from the refrigerant vapor. The vapor in turn absorbs moisture from the liquid refrigerant. In this conversion process,

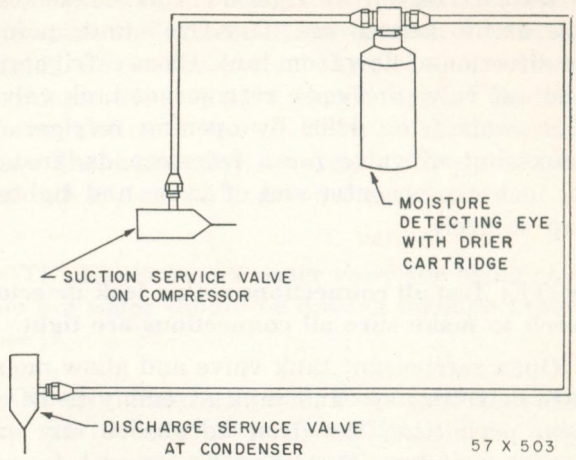


Fig. 21—Moisture Detecting Eye and Drier Cartridge Installation (Schematic Drawing)

if the drier cartridge is allowed to remain in system long enough, it will also partially reactivate or dry-out the system's saturated drier.

To remove the drier cartridge, dry eye and tubing from compressor proceed as follows: Back-seat discharge and suction service valve stems (counter-clockwise). Remove tubing, and drier cartridge assembly from suction and discharge service valves. Replace service port caps. Install flare plugs in tubing ends to seal out moisture. Tighten all connections securely, and check compressor belts for correct tension.

16. CHARGING THE SYSTEM

(Using Moisture Detecting Eye With Drier Cartridge)

Refer to Figures 21 and 22 and proceed as follows: Assemble moisture detecting eye and

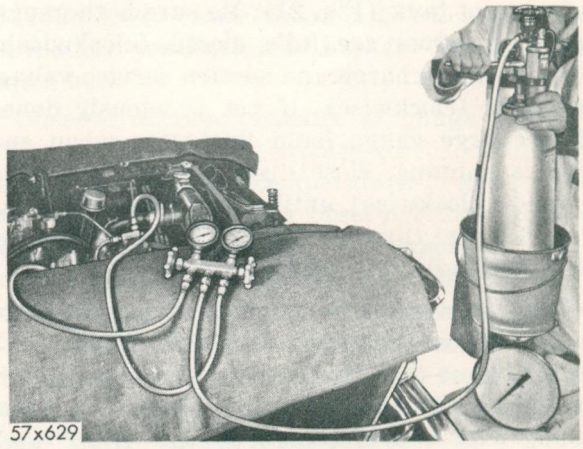


Fig. 22—Charging the System

drier cartridge to refrigerant tank. Make sure the arrow located on "Dry-Eye" unit, points in direction of flow from tank. Close refrigerant shut-off valve and open refrigerant tank valve. Purge air from drier by opening refrigerant tank shut-off valve for a few seconds. Install ¼ inch cap on outer end of valve and tighten cap securely.

NOTE: Test all connections with a leak detector torch to make sure all connections are tight.

Open refrigerant tank valve and allow moisture detecting eye and tank assembly to be at rest, permitting the drier to absorb any excessive moisture that may be present in refrigerant liquid.

NOTE: Always allow sufficient time for moisture detecting eye to change to a deep blue before attempting to charge or add refrigerant to system.

When Drier and Dry-Eye Cartridge assembly is coupled to a refrigerant tank for the absorbsion of moisture, the window of the moisture detecting eye will show a color dot indication, such as pink, if the refrigerant vapor in the charging tank is above 30 (PPM) of moisture. As the Drier Cartridge absorbs the excessive moisture content of the refrigerant, the moisture detecting eye will gradually change to a **light blue,** indicating a lower moisture content, to to 20 (PPM). The eye will change to a **deeper blue** as the vapor content is reduced. Refrigerant with a 10 (PPM) moisture content can be considered safe to use in the air conditioning system.

Connect eight-foot test hose to the center fitting of gauge manifold and to connection of refrigerant tank (Fig. 21). Be sure both gauge manifold valves are fully closed (clockwise). Open both discharge and suction service valves one turn (clockwise), if not previously done. If discharge gauge hand fluctuates when engine is running, close discharge valve slowly (counter-clockwise) until gauge hand steadies. Use "Charge through Drier". Refer to Figure 21 and install drier, as indicated.

Open valve tank one turn and loosen eight-foot test hose at gauge manifold. Leave connection loose for about a second to purge air from hose. Start engine and operate at 1200 r.p.m., with blower control set to "High" and temperature control set at "Cold".

Set tank upright in pail of warm water. The temperature of warm water must not exceed 125 degrees F. Set pail and tank on scale (Tool C-3429) and weigh assembly. Make note of combined weight.

WARNING

It is absolutely essential that an accurate scale, such as Tool C-3429, be used. Bath scales are not accurate below 100 lbs.

Open suction valve on gauge manifold slightly (counter-clockwise). Control refrigerant entering system with this valve. **Do NOT allow suction pressure to exceed 60 psi.** Be sure both discharge and suction pressure service valves are open about one turn (clockwise). Carefully watch scale and shut tank valve off when system has absorbed three pounds. If partial charge is desired for testing leaks, charge system with refrigerant gas charge until 100 pounds pressure is reached on discharge pressure gauge.

Close suction valve on gauge manifold (clockwise). To disconnect tank, loosen eight-foot test hose, allow refrigerant in hose to escape slowly, and remove hose from tank.

17. TESTING THERMAL SWITCH

NOTE: The thermal switch is adjustable. When adjusting the switch, use eccentric slot located on side to adjust in a clockwise direction for "Cold" or (counter-clockwise) direction for "Warm". When midway between "Cold" and 'Warm", the temperature setting will be "Normal", which is the standard factory setting.

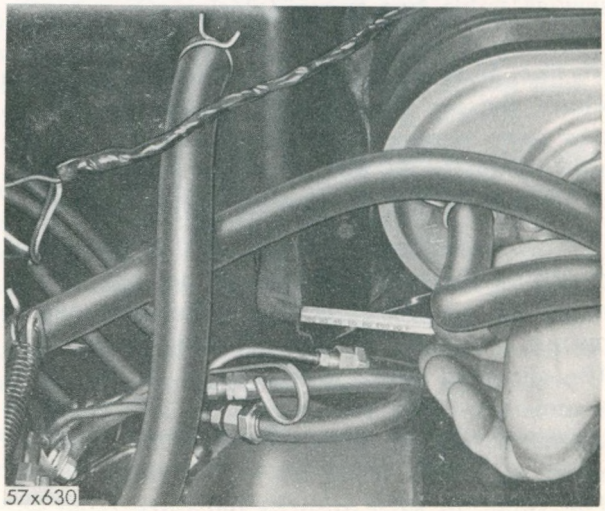


Fig. 23—Checking Thermal Switch

Check air conditioning system for being fully charged. Refer to "Checking Refrigerant by Sight Glass Method". Paragraph 10.

Remove thermometer hole plug from lower left side of evaporator heater housing. To insure a good thermal contact with suction line well, apply coating of about $\frac{1}{16}$ of an inch of non-hardening graphite-aluminum compound to bulb of thermometer.

Insert thermometer bulb through hole in evaporator housing into well of suction line (Fig. 23). With cloth, sponge rubber, or other material, tightly seal the hole opening between thermometer and heater housing. Attach one lead of a test light, Tool C-744, to the compression circuit and the other lead to ground.

Position test light where its function can be observed readily when reading thermometer. Start engine and adjust engine speed to 1200 r.p.m. Place toggle control switch on "Cooling", and move the air conditioning control lever to "Cold". When the controls are located in these positions, the test light should light. Turn the blower switch to "Low". Close all windows and allow thermal switch to cycle a few times, indicated by test light going on and off.

NOTE: Check heater water valve for being cold (no hot water should be flowing through heater core).

Observe test light and thermometer. Cycle the thermal switch a few times. Test light should go out when thermal switch contacts open, and be "ON" when switch closes.

The following specifications will indicate the opening and closing degrees of the thermal switch.

NORMAL		COLD		WARM	
Open	**Close**	**Open**	**Close**	**Open**	**Close**
34°+2°	37°+2°	30°+2°	34°+2°	42°+2°	45°+2°

18. TESTING FOR PROPER SUPER HEAT

To test evaporator expansion valve for super heat, make sure the air conditioning system is fully charged with "Refrigerant 12", and is dry. Use a moisture detecting eye to check system for being dry. Make a compressor capacity check and check all the other components for proper working condition.

Install thermometer in evaporator, as outlined in "Testing Thermal Switch Test", Paragraph 17. Start engine and adjust engine speed to 1200 r.p.m. Turn toggle switch to cooling position. Place control lever in "Cold" position. This will close fresh air door and open recirculation door, allowing sufficient heat from engine to enter fresh air door slots to load the evaporator.

NOTE: To assure sufficient heat from engine compartment entering the fresh air door slots, place a small mat or cardboard over the opening between the hood and the body. This will direct the hot air into the cowl vent.

Turn blower switch to "High". Open car windows. Feel the heater water valve to make sure no hot water is flowing through the heater core. After operating engine for 10 minutes, allow system to normalize. Take reading of suction gauge pressure, and check evaporator thermometer temperature.

NOTE: The method used to determine whether the proper amount of refrigerant is metered into the evaporator coils is to determine the number of degrees of super heat the vapor has absorbed in the coils. The specifications are 8 to 15 degrees super heat. It is calculated for all models. See Example Chart for Determining super heat.

Observe suction pressure at gauge and obtain the nearest temperature corresponding to this pressure from Temperature-Pressure Relation Chart. From the observed temperature reading on thermometer in evaporator, subtract 5 degrees to compensate for thermometer connection error and suction line pressure drop. The temperature difference between the suction pressure temperature relation and the corrected evaporator temperature should not be less than 8 degrees nor more than 15 degrees super heat.

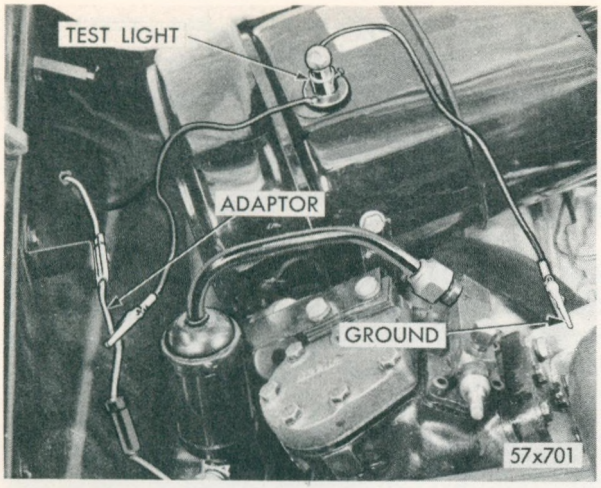
EXAMPLE OF CHART FOR DETERMINING SUPER HEAT

A Observed Suction Pressure at Gauge	B Temperature Relation of Suction Pressure	C Observed Thermometer Temperature at Evaporator	D Corrected Evaporator Thermometer Temperature, 5 Degrees Subtracted	E Super Heat
25 lbs.	26°	41°	36°	10°
30 lbs.	32°	47°	42°	10°
35 lbs.	38°	53°	48°	10°
40 lbs.	43°	58°	53°	10°

NOTE: Subtracting "B" from "D" will equal super heat at "E".

TEMPERATURE AND PRESSURE RELATION CHART FOR REFRIGERANT (FREON 12 OR GENETRON 12)

Temp. F.	Press. of Refrig.	Temp. F.	Press. of Refrig.	Temp. F.	Press. of Refrig.	Temp. F.	Press. of Refrig.
0	9.1	43	39.7	76	78.3	109	135.1
2	10.1	44	40.7	77	79.2	110	136.0
4	11.2	45	41.7	78	81.1	111	138.0
6	12.3	46	42.6	79	82.5	112	140.1
8	13.4	47	43.6	80	84.0	113	142.1
10	14.6	48	44.6	81	85.5	114	144.2
12	15.8	49	45.6	82	87.0	115	146.3
14	17.1	50	46.6	83	88.5	116	148.4
16	18.3	51	47.8	84	90.1	117	151.2
18	19.7	52	48.7	85	91.7	118	152.7
20	21.0	53	49.8	86	93.2	119	154.9
21	21.7	54	50.9	87	94.8	120	157.1
22	22.4	55	52.0	88	96.4	121	159.3
23	23.1	56	53.1	89	98.0	122	161.5
24	23.8	57	55.4	90	99.6	123	163.8
25	24.6	58	56.6	91	101.3	124	166.1
26	25.3	59	57.1	92	103.0	125	168.4
27	26.1	60	57.7	93	104.6	126	170.7
28	26.8	61	58.9	94	106.3	127	173.1
29	27.6	62	60.0	95	108.1	128	175.4
30	28.4	63	61.3	96	109.8	129	177.8
31	29.2	64	62.5	97	111.5	130	182.2
32	30.0	65	63.7	98	113.3	131	182.6
33	30.9	66	64.9	99	115.1	132	185.1
34	31.7	67	66.2	100	116.9	133	187.6
35	32.5	68	67.5	101	118.8	134	190.1
36	33.4	69	68.8	102	120.6	135	192.6
37	34.3	70	70.1	103	122.4	136	195.2
38	35.1	71	71.4	104	124.3	137	197.8
39	36.0	72	72.8	105	126.2	138	200.0
40	36.9	73	74.2	106	128.1	139	209.2
41	37.9	74	75.5	107	130.0	140	205.5
42	38.8	75	76.9	108	132.1		



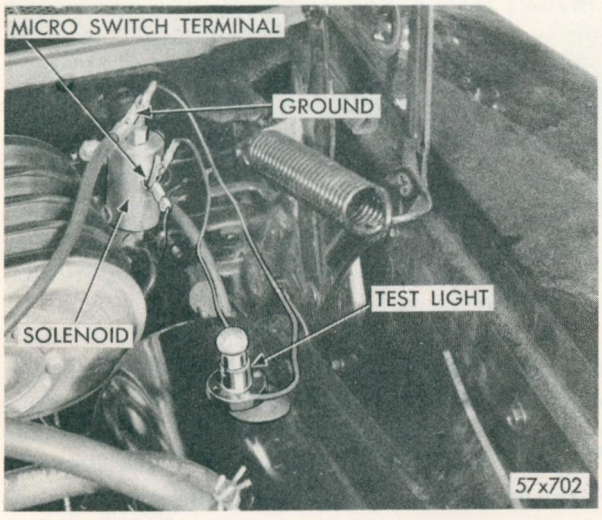


Fig. 24—Testing Control Circuits

19. TESTING ELECTRICAL SWITCHES AND CONTROL CIRCUITS

Refer to Figure 24 and proceed as follows: With test light, Tool C-744, located on windshield, attach one end of lead to solenoid valve terminal, and the other to ground. Start engine and adjust engine speed to 1200 r.p.m. Turn toggle switch to "Cool" position. Move air conditioning control lever to "Off" position. With lever located in this position test lamp should light (recirculation door open, fresh air door closed). With control lever to "Cold", position test lamp should light (recirculation door open, fresh air door closed).

Then with control lever to "Warmer" position test lamp should not light (recirculation door closed, fresh air door open). Turn toggle switch to "Heat" position and move control lever to "Off" position (test lamp should light) —recirculation door open, fresh air door closed. Move control lever to "Cold" position (test lamp should now be out)—recirculation door closed, fresh air door open. Move control lever to "Warmer" position (test lamp should be out)—recirculation door closed, fresh air door open. Move control lever back to "Off" position. Re-locate test light, attaching one lead to water valve element circuit and the other lead to ground. With toggle switch in "Cold" position and control lever in "Off" position (test lamp should be off). Move control lever to "Cold" position (test lamp light dimly). Move control lever to "Warmer" position (test lamp should increase from dim to bright as resistance is decreased in rheostat. Feel the water valve element. Valve should go from warm to hot as control lever is moved to the "Warmer" position. Check the three blower motor connections for being tight in connector. Tighten if necessary.

20. PRECAUTIONS TO OBSERVE IN HANDLING TUBING

a. Cleanliness During Installation

A piece of tubing that has been cut, flared and prepared for installation should be clean and dry.

b. Cutting and Flaring

Use Tool C-3478 to cut, eliminate burrs, and ream tubing. The tube should be double-flared with tool.

Always inspect flared joint before installation to determine if there are any cracks or blemishes on flare that would cause a possible leak.

NOTE: Copper washers must be used where joint is steel-to-steel, steel-to-brass or brass-to brass. Copper to steel or brass requires no washer. Use refrigerant oil on flared surface connections when installing or repairing leaky tube connections to improve sealing and reduce torque required. Never use any sort of sealing compound between tube flare and male surface.

c. Securing the Tubing

Copper tubing must be attached to car structure. A flexible connector (vibration elimina-

tor) has been placed on the condenser side of compressor to guard against breakage at that point.

d. Brazing the Joints

Discharge system before using a torch to braze leaking joints. Avoid excessive heat when using an acetylene flame to solder or braze a joint. The usual precautions should be followed before repairing a sweat-type joint, such as cleaning thoroughly, applying sufficient flux, heating to temperature that will cause silver solder to flow freely, and testing joint after making repairs.

Only the following component parts of compressor are available for service: compressor unit valve plate assemblies, suction service valve, discharge service valve, cylinder head, gaskets, muffler assemblies, shaft seal and support brackets. The compressor refrigerant oil may be replaced or corrected to proper level. Any damage to pistons, cylinders, crankshaft or connecting rods, requires replacement of complete compressor assembly.

21. MEASURING COMPRESSOR OIL LEVEL

NOTE: If the oil level is checked immediately after a long, fast trip, the oil level will be slightly lower than normal.

Locate the air condition operating lever on "Cold", blower "High", toggle switch "Cool", car windows open. Start engine and operate at 1200 r.p.m. for about 10 minutes to return any excessive oil in system to compressor crankcase. Stop engine and remove protective caps from discharge and suction service valves. Close both valves by turning valve stems clockwise with Tool C-3361 until valves are seated firmly.

NOTE: The engine should never be started with the discharge or suction service valve closed.

Clean area around the compressor filler plug and discharge service valve port cap with solvent and blow dry with compressed air. Carefully loosen the ¼ inch flare cap fitting of the discharge service valve one-quarter of a turn and gradually release or purge the gas pressure from the compressor. When the pressure in compressor is completely purged, loosen (do not remove) the oil filler plug on side of compressor just enough to allow gas pressure (if any) in crankcase to escape.

When pressure has been released, remove filler plug and use a clean dry plunger type dipstick (⅛ inch round or similar rod) to measure oil level.

The correct oil level is from 2 to 2½ inches. Add MOPAR air conditioning compressor oil (300 Saybolt at 100 degrees F.), as required, or siphon off excess oil if necessary. After oil level has been checked and corrected, replace the filler oil plug.

To purge air out of the compressor cylinder and crankcase, make sure cap on the discharge valve service port is loosened approximately one-half turn. Using Tool C-3361, slightly open the suction service valve stem (counter-clockwise). Let gas drift slowly through compressor for about 10 seconds.

Tighten cap on the discharge service port. Back-seat both discharge and suction service valves by turning the valve stems (counter-clockwise). Replace protective caps on the discharge and suction service valves and tighten securely.

22. REMOVAL AND INSTALLATION OF AIR CONDITIONING UNIT

a. Removal

From inside the passenger compartment, remove the hydraulic actuator piston, bracket, and operating linkage.

From the engine compartment, drain antifreeze from radiator. Remove air cleaner. Remove ignition distributor cap and base assembly, if necessary. Disconnect upper and lower hot water heater hose from evaporator cover outlet. Disconnect blower and wires from Acro connector. Remove blower to dash attaching bolts, including blower motor ground wire to dash, and remove blower and assembly. Remove air conditioner evaporator cover to dash attaching bolts, and remove cover assembly. (Fig. 25.)

Remove thermal switch leads. "Discharge the System", as outlined in Paragraph 11. Disconnect suction and liquid line. Remove remaining evaporator housing flange to dash screws and remove evaporator by depressing fresh air door with screw driver as evaporator is rolled out of dash pocket.

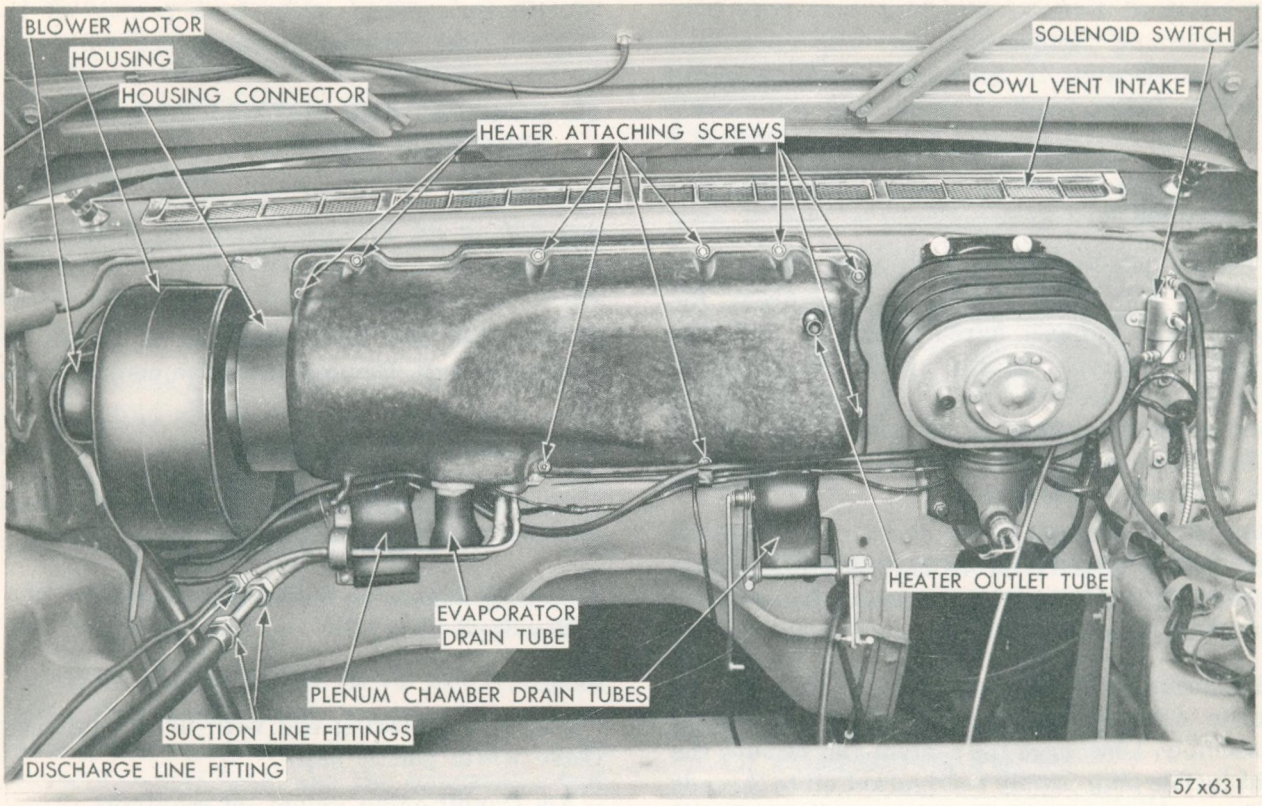


Fig. 25—Heater-Air Conditioning Unit Installed

NOTE: Whenever the air conditioning unit is removed from car, cooling coil fins should be cleaned and the water outlet drains should be checked for being open before reinstalling.

b. Installation

Install unit in the reverse order of removal. Evacuate, sweep and charge system, as indicated in Paragraphs 12 and 16. Install blower and heater hoses. Check system for leaks, the fan belt for proper tension and make certain radiator contains sufficient coolant.

23. REMOVAL OF HEATER CORE

Remove heater core to evaporator housing attaching screws. Carefully slide core assembly to left and remove core.

CAUTION

Use care when removing core to avoid damaging equalizer lines.

24. REPLACEMENT OF RECEIVER STRAINER-DRIER (Fig. 26).

Wherever the receiver strainer-drier unit is plugged and has to be removed from car, proceed as follows:

a. Removal

Discharge the system, as outlined in Paragraph 11.

CAUTION

Protect eyes with goggles before disconnecting receiver flare connections.

Disconnect flared connections at both ends

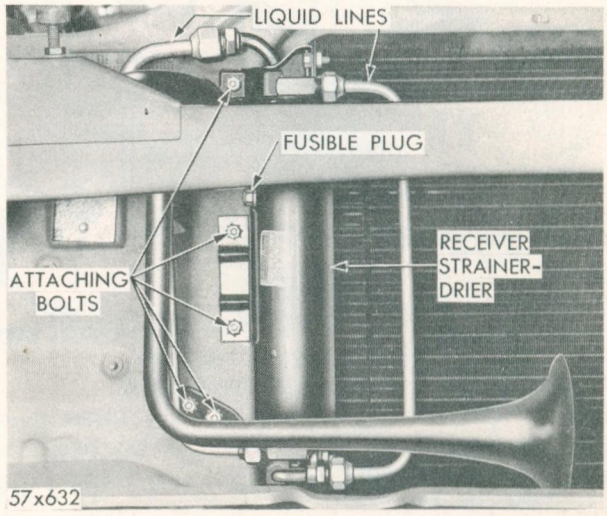


Fig. 26—Receiver Drier Installed

of receiver. Remove attaching bolt nuts from bracket and remove receiver. Cap open lines if new receiver is not to be installed immediately. Leave caps on connectors until ready to install.

b. Installation

Position receiver in place, install bracket attaching bolts, and tighten nuts securely. Remove caps, connect flared connector nuts and tighten securely. Charge system with partial charge and test for leaks. Correct any leaks and evacuate system, as outlined in Paragraph 12. Charge with three pounds of refrigerant, as outlined in Paragraph 16.

25. REPLACEMENT OF RECEIVER STRAINER-DRIER FUSIBLE PLUG (Without Removal From Car) (Fig. 26)

Replacement of damaged fusible plug can be made without removal of unit from bracket assembly. Discharge the system and remove the old fusible plug. Apply refrigerant oil to threads of new plug, and install plug in receiver. Tighten to 20 foot-pounds torque. Never replace a damaged fusible plug with a pipe plug.

Evacuate system, as outlined in Paragraph 12. Charge system with three pounds of refrigerant, as outlined in Paragraph 16.

26. REMOVAL AND INSTALLATION OF EXPANSION VALVE

a. Removal

Disconnect the $\frac{3}{8}$ inch and $\frac{1}{2}$ inch line flare fittings.

NOTE: Use two flare wrenches to loosen or tighten fittings. Remove the valve control bulb.

CAUTION

Cap or plug open lines to prevent moisture from entering system.

b. Testing Expansion Valve (Equipment Required) (Fig. 27)

Source of dry air 90 to 250 psi.

Moisture detecting eye with drier cartridge (save white plastic cap).

Air Conditioning gauge set manifold.

Transmission throttle pressure gauge.

Compressor capacity test cap with .020 inch bleed hole.

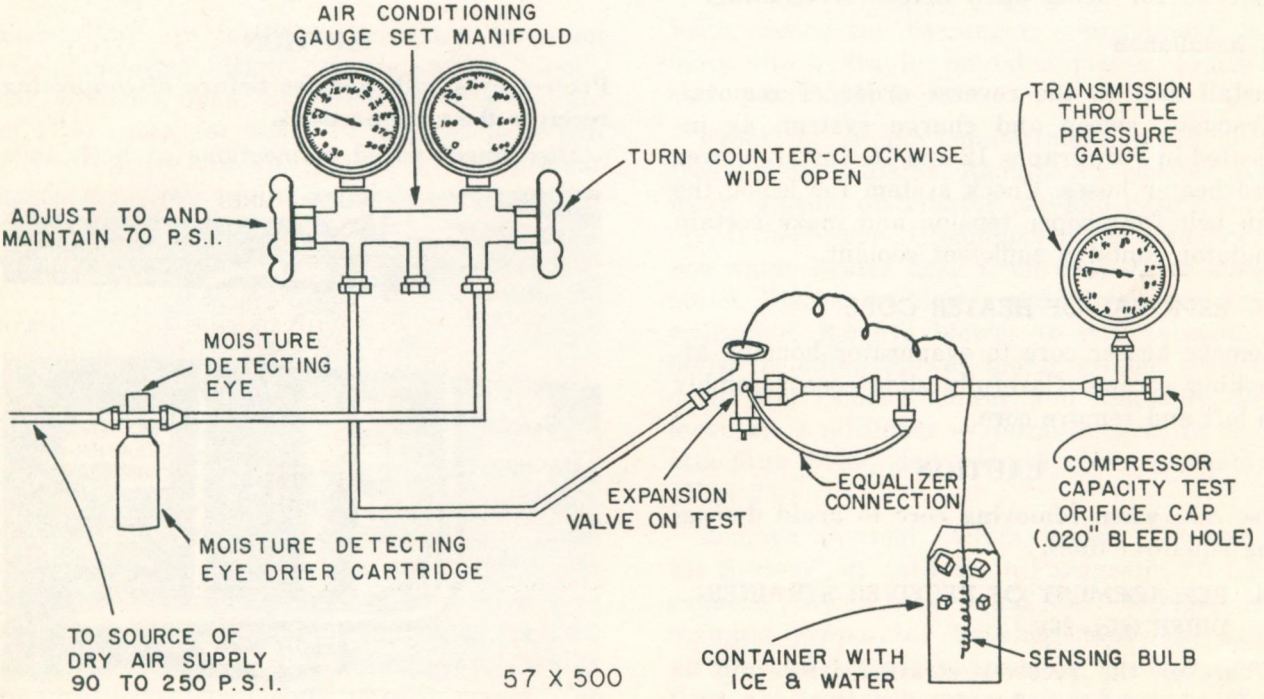


Fig. 27—Testing Expansion Valve (Unit Removed from Car)

Container with ice and water to hold temperature at 32 degrees F. ¼ inch copper tubing and fittings as used in attached drawing (Fig. 27).

c. Test Procedure

1. Direct source of dry air, 90 to 250 psi. through moisture detecting eye with drier cartridge attached to insure against any moist vapors or particles of dirt entering the valve.

2. With the left hand shut-off valve on gauge set manifold closed and the right hand valve open, the right hand gauge will indicate the pressure of the air supplied. Slowly open the left hand shut-off valve (counter-clockwise) until left gauge indicates 70 psi.

3. Immerse the expansion valve sensing bulb into the water and ice bath (32 degrees F.).

4. With the expansion valve inlet pressure gauge (left hand gauge) reading 70 psi., the sensing bulb completely submerged in the 32 degree F. water bath, and the compressor test cap bleeding off pressure, the outlet pressure gauge should read between 23 and 26 psi.

5. Remove sensing bulb from water bath and warm bulb in hand. With expansion valve inlet pressure still reading 70 psi. (adjust if necessary), the outlet pressure should rise to a pressure of not less than 53 psi.

If expansion valve successfully passes these tests, it may be considered to have the proper super heat setting, a proper pressure limit valve, the rated capacity and that it has not lost its thermal charge. The valve should, therefore, give satisfactory performance. If expansion valve fails to pass either test No. 4 or No. 5, it should be rejected.

d. Installation

Reinstall expansion valve, control bulb, and equalizer lines in the reverse order of removal. Tighten all connections securely, and sweep and charge system, as indicated in Paragraphs 13 and 17.

27. REMOVAL AND INSTALLATION OF COMPRESSOR (Fig. 28).

Discharge the system, as outlined in Paragraph 11. Remove the suction and discharge lines.

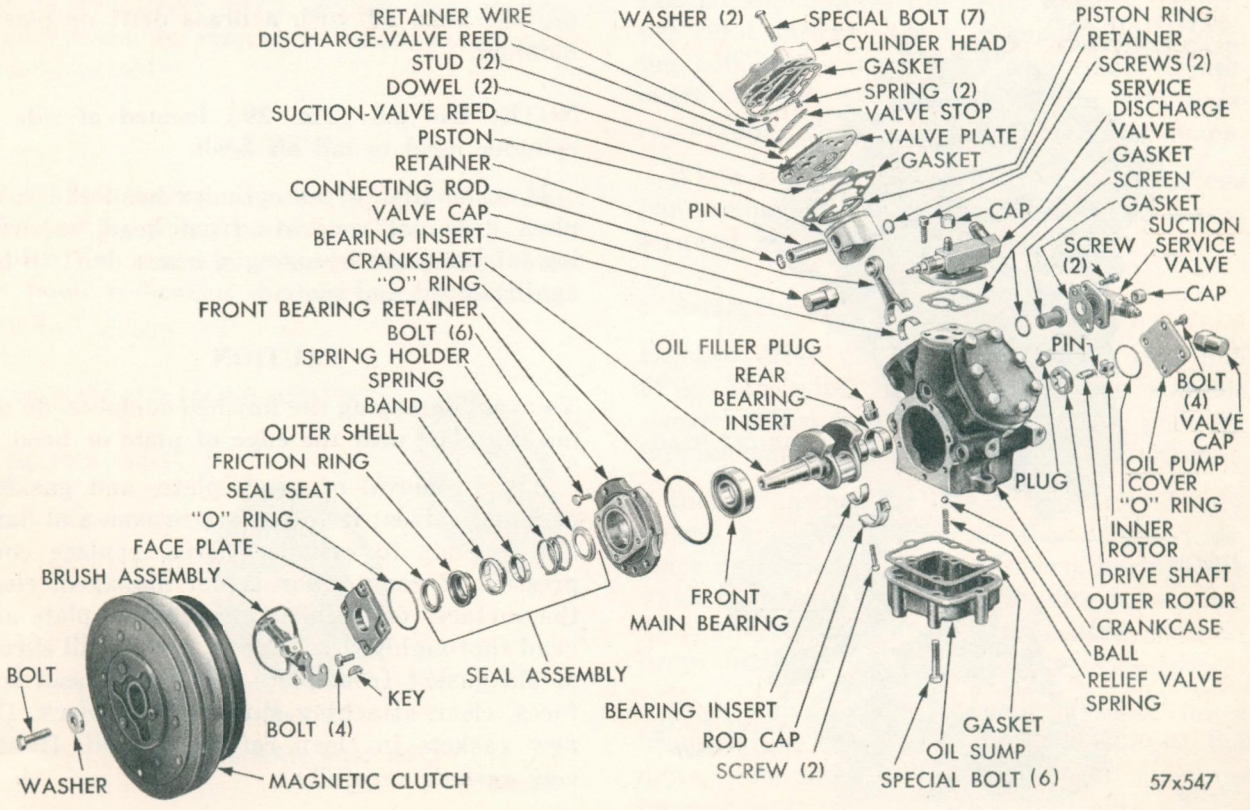


Fig. 28—Disassembled View of Compressor

CAUTION

Plug or cap all lines as soon as they are disconnected to keep moisture out of the system.

Disconnect magnetic clutch to control unit wire. Remove compressor pulley belts. Remove compressor to bracket attaching bolts and remove compressor.

NOTE: When replacing the compressor, it is imperative that the oil in the compressor be checked to the proper level (2 to 2½ inches). Refer to Paragraph 6 for measuring procedures.

Replace compressor in the reverse order of removal and adjust fan belt.

28. REMOVING COMPRESSOR CYLINDER HEAD

With gauge set installed as indicated in Paragraph 6, rotate discharge and suction service valve stems clockwise until both valves are fully front-seated. Slowly open the discharge gauge hand valve slightly to relieve compressor pressure through the center outlet hose and into an exhaust suction system. When pressure drops to zero on discharge gauge, open suction pressure gauge hand valve.

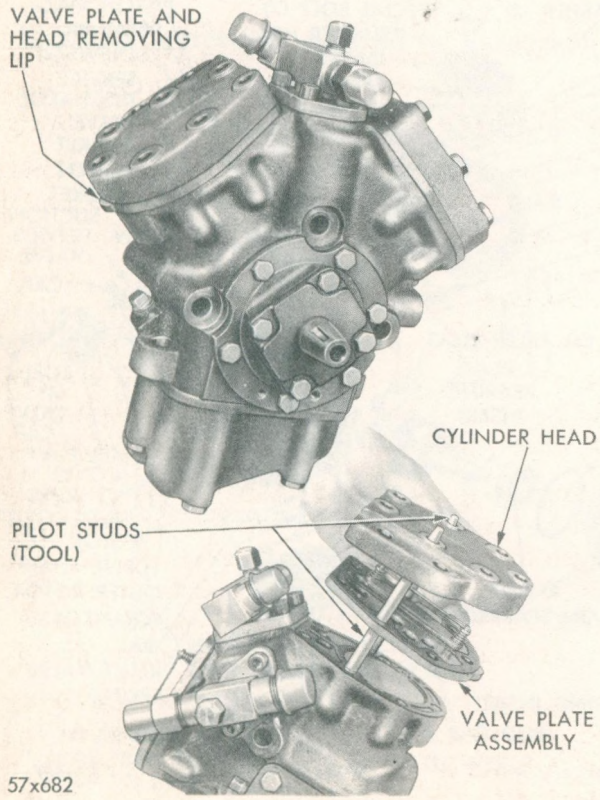


Fig. 29—Removing Compressor Head

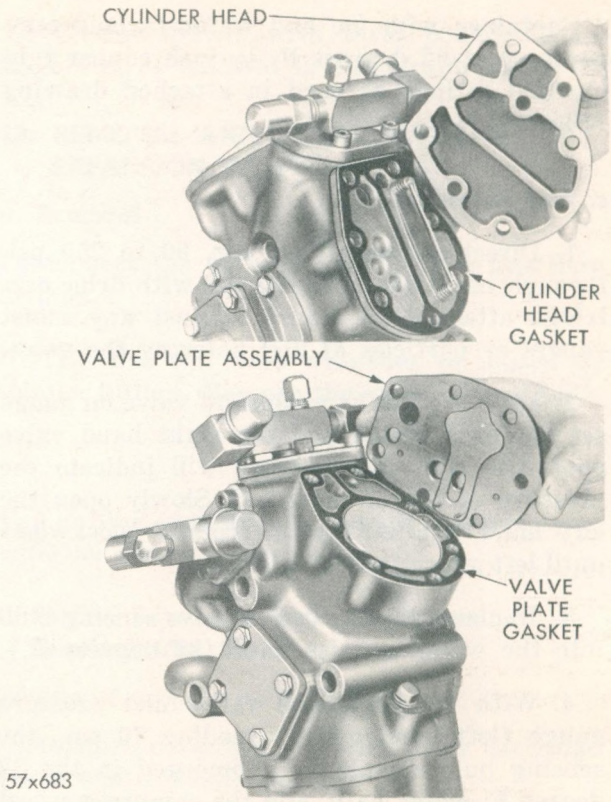


Fig. 30—Replacing Head Gasket

Remove compressor cylinder head bolts and tap the head off with a brass drift or plastic hammer.

NOTE: Use tab (Fig. 29) located at side of cylinder head to tap off head.

If when lifting the cylinder head the valve plate does not separate from head, separate head from plate by using a brass drift to tap against head and plate.

CAUTION

To avoid damaging the finished surfaces, do not tap the plate near the edge of plate or head.

After removal of head, plate, and gaskets, examine valves; if valves are broken and damage extends to cylinder bores, replace compressor. If compressor is not damaged, clean the surfaces of cylinder block, valve plate and head thoroughly. Use care to remove all shreds of old gasket from plate, block and head surfaces, clean attaching stud holes in block. Dip new gaskets in clean refrigerant oil. Handle new gaskets carefully.

NOTE: Both head and valve plate gasket can

only be assembled in one position. See Figure 30 for method of correct assembly.

Install cylinder head gasket, valve plate and valve plate gasket and cylinder head. Place assembly on cylinder block and align the assembly to cylinder. Install attaching bolts, tighten each bolt alternately and evenly to 26 foot-pounds torque.

Purge air from the compressor by opening the suction service valve (counter-clockwise) slowly and loosening the discharge service port cap for a few turns for about 10 seconds. This will allow the gas to drift through the compressor and bleed air from the system. Rotate both discharge and suction service valves (counter-clockwise) until they are fully back-seated. Start engine and locate control lever on "Cold". Operate engine for five minutes, stop engine, and test for leaks, as outlined in Paragraph 9. If there are no leaks and the system is operating satisfactorily, remove gauge set and replace valve caps.

29. SERVICING THE MAGNETIC CLUTCH (Fig. 31)

Servicing the magnetic clutch assembly is limited to the drive plate, pulley and electro-magnet assembly, snap rings, bearing and brush holder assembly.

CAUTION

DO NOT attempt to remove the electro-magnet coil from the pulley assembly. The coil is held in place by a special adhesive material. Once this bond is broken the coil cannot be re-attached.

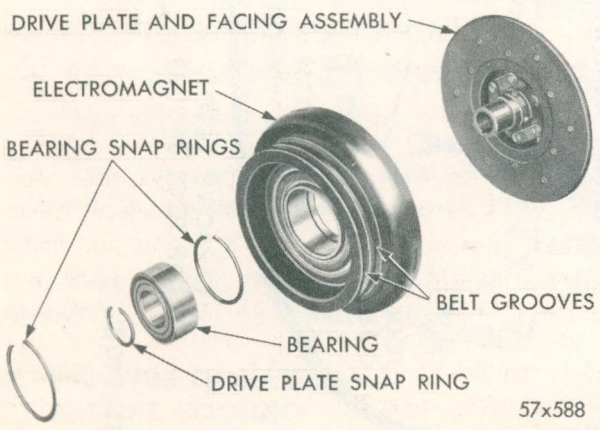


Fig. 31—Magnetic Clutch (Disassembled View)

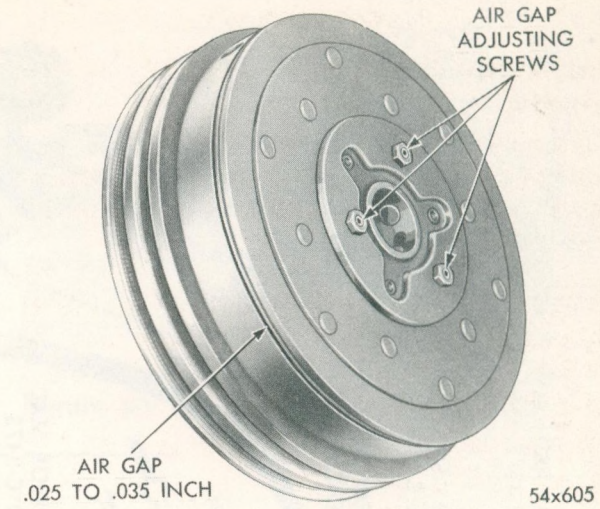


Fig. 32—Air Gap Adjustment

a. Testing Electro-Magnet Current Draw

To test the coil for a short or open circuit, connect an ammeter (0-10 Ampere Scale) in series with a fully charged 12-volt battery and the insulated brush lead. The current draw at 12 volts should be 1.5 to 2 amperes.

b. Removing Clutch Assembly from Compressor

Loosen and remove the belts. Remove the upper right shroud section. Remove special locking bolt and washer from compressor crankshaft at front center of clutch. **Do NOT damage brushes when removing or installing clutch.**

While supporting clutch assembly with one hand remove the pulley with $\frac{5}{8}$ inch cap screw, screwed into end of clutch shaft.

c. Removing and Installing Drive Plate

Remove drive plate retaining snap ring hub (Fig. 31) with Tool C-3301. Place suitable sleeve against hub and remove drive plate by tapping against sleeve with a soft hammer.

Inspect springs for loss of tension and (or) cracks, and inspect liner on face of plate. Replace drive plate if liner is worn, springs are weak or broken, or if drive plate is warped. (A sintered iron liner impregnated with fibrous material is bonded to the drive plate).

Start drive plate hub squarely into inner bearing race. Place a brass drift against the drive plate inner hub and tap plate hub into bearing by tapping on brass drift with a hammer while supporting the inside race. Install

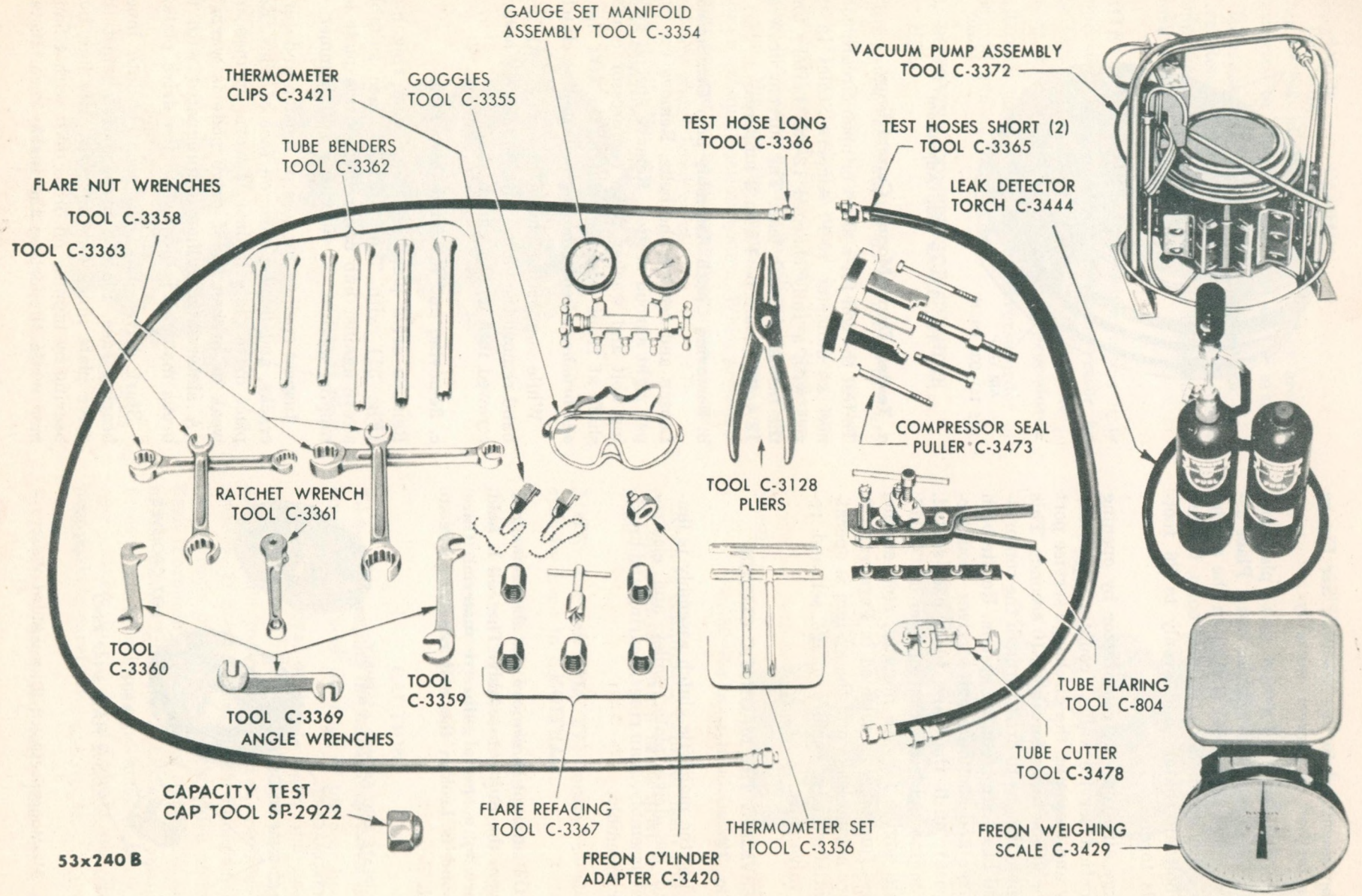


Fig. 33—Special Heater-Air Conditioning Tools

snap ring on drive plate hub. Use a long feeler that will reach into gap at hub and measure air gap between drive plate and electro-magnet (Fig. 32). Air gap should measure .025 to .035 inch. Adjust air gap by turning the three screws on the front face of the drive plate. Adjust all three screws to obtain an evenly spaced air gap.

d. Removing Clutch Bearing

Remove drive plate, as outlined in Paragraph 29, "c". Remove snap ring and grease slinger (at outer race of bearing) from pulley assembly. Tap bearing from pulley assembly. Install bearing and snap ring and drive plate.

e. Installing Clutch Assembly on Compressor

Align key and keyway and push assembly over shaft and key. Install self-locking bolt and washer. Install upper right shroud section. Purge air from the compressor, back-seat both service valves, and tighten oil filler plug.

For Air Conditioning Service Tools refer to Figure 33.

SERVICE DIAGNOSIS

No attempt should be made to use the diagnosis information as a method of trouble shooting or spot checking. When properly used (as an aid to the complete test procedure), the diagnosis will be of considerable value to the service man.

30. BLOWER NOT OPERATING

a. Test electrical circuit with point-to-point voltmeter test. Replace or repair broken wire.

b. Test motor, and repair or replace.

c. Test switch with voltmeter or jump wire. Replace faulty switch.

d. Test circuit with voltmeter for voltage drop. Clean and tighten all loose connections.

31. BLOWERS AND COMPRESSOR OPERATING—NO COOLING

a. Check for low refrigerant. Recheck system after testing and repairing all leaks.

b. Test for moisture with dry-eye.

c. Test compressor capacity.

d. Test for restriction in strainer-drier, as outlined in Paragraph 24. Inspect lines for kinks.

e. Test expansion valves, as outlined in Paragraph 26. Clean or replace valve.

32. BLOWERS OPERATING—PARTIAL COOLING

a. Check sight glass for indication of low refrigerant. Check for leaks, and charge system.

b. Test for moisture.

c. Test compressor capacity, as outlined in Paragraph 6.

d. Test thermal switch, as outlined in Paragraph 17.

e. Inspect condenser for kinks or obstructions. Clean with air or replace.

f. Clean air passages through condenser with warm water and compressed air applied from side next to engine.

g. Test temperature-pressure relation of refrigerant.

33. LOW SUCTION PRESSURE AND LOW HEAD PRESSURE

a. Check sight glass for indication of low refrigerant. Check for leaks, and charge system.

b. Test for moisture.

c. Test compressor capacity.

d. Test for restricted strainer-drier, as outlined in Paragraph 24. Replace if faulty.

e. Check for kinked liquid line. Replace liquid line if required.

34. SUCTION PRESSURE O. K. AND HIGH HEAD PRESSURE

a. Check for air in system. Open gauge manifold discharge pressure valve slightly, and leave open for 10 seconds to purge air. Close

valve, start engine, and recheck gauge pressure at 1200 r.p.m.

b. Check for too much refrigerant. Operate engine at 1200 r.p.m. with blower switch turned to "High". Discharge refrigerant slowly through gauge manifold center fitting until bubbles appear in sight glass. Charge system with refrigerant, as outlined in Paragraph 16.

c. Wash out condenser with warm water and apply compressed air from side next to engine.

35. LOW SUCTION PRESSURE—HEAD PRESSURE O. K.

a. Test for moisture.

b. Test for restricted receiver-strainer.

c. Test super heat.

36. TESTING FOR LEAKS WITH LEAK DETECTOR (For Diagnosis)

Where a system has been found to be low on refrigerant or following repairs on the system that necessitated the opening of a connection, it is necessary to test for leaks, as described in Paragraph 9.

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